

The background of the entire page is a stylized, layered mountain range in various shades of teal and green. The mountains are depicted with soft, painterly edges, creating a sense of depth and atmosphere. The title is centered within a white rectangular border.

PARTNERSHIPS & SUSTAINABILITY

**Proceedings of the Sixth Biennial
Linear Parks Conference
1995**

Proceedings of the

SIXTH BIENNIAL



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America's Long-Distance Trails: Corridors of Opportunity

by *Steven Elkinton, National Park Service, Washington, DC*

ABSTRACT

Since 1968, 19 federally-administered national scenic and historic trails have been established. They range greatly in length, impact, use levels, and popular support. Some are well known (Appalachian Trail, Oregon Trail, Santa Fe Trail) and are catalysts for proven economic benefits to local economies, conservation of related resources, and enduring public-private partnerships. Others (such as the Trail of Tears, Overmountain Victory Trail, and Florida Trail) are less well known, but have the potential for significant impact in future years.

This presentation will outline the current components of the National Trails System, key issues which face both managers and the public along these trails, and research concerning these trails. Of special note will be a current study by North Carolina State University on developing a methodology for assessing the economic impacts of long-distance trails. In seeking self-sustaining mechanisms to perpetuate and protect these trails, similar programs – such as scenic byways and national heritage corridors – will also be referenced.

The conclusion will address the issue of sustaining partnerships – what can be learned from the cumulative experience among these trails about enduring citizen action linked to government trail programs. How might these partnerships be affected by recent political changes? What can both sides in a partnership do to sustain their long-term attention and commitment? National trails have been a great laboratory for this work for the past quarter century.

INTRODUCTION

How many of you have ever knowingly travelled on a national trail?

How many of you knew that there existed today a National Trails System? That it touches all but 6 states? That it includes 19 trails and totals more than 35,000 miles in combined length?

It is my privilege, working in the National Park Service in Washington, D.C., to help coordinate federal involvement in these trails under the authorities of the National Trails System Act. It was a farsighted act, 27 years ago, using the Appalachian Trail as a model, and creating these trails from the start as partnerships.

During the life of the National Trails System Act – an Act which encouraged all kinds of partnerships: federal-state, federal-private, state-local, trail-to-trail, etc. – good examples can be gleaned for students of sustainable partnerships. Today I would like you to join me on a tour of America's national scenic trails (NSTs) and national historic trails (NHTs) and then talk together about some of the sustainable partnership models which have been created to support them, and some of the issues which may discourage or encourage such long-term, resource-based partnerships.

COMPONENTS

I would like to quickly present these trails as a continuum of the history of transportation and settlement in North America.

In 1775, the Spanish governor of an obscure outpost in what is now southern Arizona persuaded the Spanish

crown to allow him to try and find and colonize the fabled inland sea behind the Golden Gate. Hence the Juan Bautista de Anza NHT commemorates the Spanish colonization of the San Francisco Presidio. It was established as an NHT in 1990.

In 1780, during the American Revolution, frontier settlers heading towards Cumberland Gap the Overmountain Patriots and pushed back the British militia at the Battle of Kings Mountain (leading eventually to British surrender at Yorktown). Today the 300-mile long Overmountain Victory NHT, stretching from Abingdon, Virginia, through Tennessee and Northern Carolina into South Carolina is the only historic trail along which is held a full re-tracement every year.

Once the new American Republic was up and running, Thomas Jefferson appointed his two trustworthy aids to explore the newly acquired Louisiana Purchase. During the years 1804 to 1806 the Lewis and Clark Voyage of Discovery followed mostly water routes from Saint Louis to the Pacific Coast. This route became one of the first national historic trails established when this category was added to the Act in 1978.

Although it existed for centuries as an Indian trail connecting the Chickasaw and Choctaw Nations to the Mississippi and Tennessee Rivers, and was later used throughout the colonial period, I peg the Natchez Trace NST at 1815 because this was the year that General Andrew Jackson defeated the British at the Battle of New Orleans after marching his troops south on the old Natchez Trace. Today this route is commemorated as a national parkway and remnant trail segments are being restored for hiking and horseback use.

In 1821 Mexico achieved its independence and the Santa Fe Trail was

opened. A tri-cultural trail: Anglo, Spanish, and Native American, it remained in use until supplanted by the railroad in 1888 and was established as a national historic trail in 1987.

In 1837 the U.S. government carried out a forced evacuation of the Cherokee Nation from the southern Appalachian Mountains to what is now Oklahoma. Those routes of evacuation are now commemorated by the Trail of Tears NHT. Once gold was discovered in northern Georgia, the evacuation took place over four different routes, two of which are part of the official trail, established in 1987.

The next four trails form an overlapping network all pouring up the Platte River from the Missouri and though the only known wagon crossing of the Rockies at South Pass, Wyoming Territory. In 1841-3 the Oregon Trail was opened. It was also one of the first NHTs established. In 1846 and 1847 Mormons, hounded from the settled eastern states, moved west on what is now marked as the Mormon Pioneer NHT. Today it is the most complete of the NHTs due in large part to network of signs and visitor centers already established by the Mormon Church. In 1849 gold was discovered in California and thousands of gold seekers poured across the country on what is known today as the 5600-mile California NHT. It follows many routes between the Missouri River and the Sierra Nevada Mountains and was established as a NHT in 1992. At the outbreak of the Civil War in 1861, the Pony Express was set up as the nation's first overland transcontinental mail service. It only lasted 18 months before going bankrupt and being supplanted by railroads, but has captured the American imagination ever since and was established as a national trail in 1992.

The Nez Perce NHT commemorates the tragic flight in 1877 of the Nez Perce people who refused to be placed on a reservation. After a summer of pursuit by the U.S. Cavalry, it ended in defeat for the Non-Treaty Nez Perce at the Battle of Bears Paw Mountains where Chief Joseph's spoke eloquent words of surrender, "From where the sun now stands, I will fight no more forever."

From 1890 to 1920 what is now the Iditarod NHT developed during the Alaska gold rush period. Today known internationally for the annual dog sled races held each winter, it is managed by the Bureau of Land Management.

Conceived in 1921, fully laid out by 1935, and established in 1968 as one of America's first two national trails, the Appalachian NST has cost taxpayers \$175 million in federal land protection to buffer the 2,158-mile trail corridor from damaging threats. The "AT" is considered the "flagship" of the National Trails System.

The other national trail established in 1968 is the Pacific Crest NST, inspired in the 1930s as a western version of the AT. Fully laid out in 1960s, the land protection program was completed by the Forest Service and BLM in 1993. It is the first national trail to be "completed." In 1978 the Continental Divide NST was established, inspired by the AT and PCT. About 1/3 completed. It offers perhaps the most challenging altitudes and terrain of any of the national trails. Trail enthusiasts in Colorado are working hard to build up a volunteer and financial base for this trail.

In 1980 the North Country NST was established, tying together eight national forests in seven states across the Great Lakes Region. Established in 1980, it modelled closely on the AT and is now about 40% completed.

Also in 1980 the establishment of

the Ice Age NST formalized a 25-year old dream of Wisconsinites to preserve the morainal edge of the glacial landscape of Wisconsin. With strong state government support, it is well on its way to becoming a unique landscape corridor, now about 35% complete as a trail.

In 1983 the Florida NST was established, another 1000-mile trail limited to one state. It has become the centerpiece to an innovative statewide greenways program throughout Florida. If any of you travel to Florida and wish to hike or volunteer sometime building trails, the Florida Trail Association would like to hear from you.

The last of the current list of national trails was also established in 1983, the Potomac Heritage NST. The idea for this trail started with President and Ladybird Johnson and their love of the Potomac River. It has always been a "top-down" trail and has never enjoyed much constituency support. Today, the Potomac River Greenway Coalition is likely to carry out the original vision of this "trail."

ISSUES

As you can see from the variety of stories and resources associated with these trails that they are a mixed lot. Indeed, my impression of them after six years in the program is that they are complicated, involving many issues which face park managers. In addition, each relies on a network of **partnerships** which are sometimes difficult to sustain.

From the **public's perspective**, many of these trails are hard to find. Publicity about them is skimpy. Many trail sites are poorly marked. Sometimes the trails organizations seem more like a private club than a public service. Many people offer to volunteer to help these trails, and without that volunteer help, the trails would languish. How-

ever, many groups do not know how to hold and attract volunteers. One true volunteer success story is the Appalachian Trail Conference's ability to bring almost 150,000 volunteer hours forward every year!

The point of view of local towns and landowners may be ambivalent. On one hand they are interested in increased visibility and tourism, on the other, nervous about new people showing up and messing things up. Landowners, especially in the West, are reluctant to open trail sites up to the public. Many communities do not even know that special trails thread through their midst and scrape them away in the name of development. Often times a gentle educational program by trail managers and supporters can turn a community around. Recently a developer in Boise was prevented from destroying a section of the Oregon Trail, instead turning into a community greenway. Sometimes threats and difficulties become opportunities for everyone to learn something new about their trail resources.

Trail enthusiasts are impatient to get on with protecting, celebrating, marking, hiking, and enjoying the trail they love. Many of the other partners may be more reluctant and feel threatened by this passion. In some places "rut nuts" are well respected, others are seen as odd. Around here some long-distance hikers are famous, while others are looked upon as a breed apart. Yet it is this devotion to trails that fires up the trails community and makes it a formidable force. They get frustrated when they see precious and irreplaceable trail resources threatened or lost. Trail lovers tend to focus on the benefits and advantages of trails, not the problems or the complexity. They also tend to stay local. As we say, paraphrasing Tip O'Neill, "All trails are local."

Trail managers are often the public servants responsible for holding a trail together – in the case of these, under specific authorities of the National Trails System Act. They may be willing, but have scarce funds. Or maybe they are eager to help, but get stuck in bureaucratic reviews. Several agencies responsible for these trails do not consider them a primary mission. Public servants try to be objective, and therefore, must balance the demands of many types of often-competing groups.

Trail issues depend in large part on your perspective. One person's problem is another's opportunity.

CURRENT RESEARCH

Trails are not a large area for research – not enough corporations can make money off them. However one study is underway in this area looking at the economic impact these trails may have on states and local communities. Based on his outstanding study of the economic impacts of rail-to-trail conversions five years ago, Dr. Roger Moore of North Carolina State University has been brought on by the National Park Service to explore the economic impacts (specifically use and spending patterns) along the Overmountain Victory National Historic Trail just south of here. Field work is underway this summer. Our hope with this study is to both develop a methodology which can be used on any long-distance trail (or heritage corridor, or scenic byway, or national parkway, etc.) for comparative data, and ascertain the specific economic dynamics along the OVNHT itself. Perhaps at the next one of these linear parks conferences Dr. Moore can come with his results.

Without ongoing research the trails community is missing out learning a lot about use patterns, user trends, new

developments in trail touring and marketing, etc.

SIMILAR LONG, SKINNY PARTNERS

I have mentioned not only trails, but other long, skinny resource corridors (parkways, scenic byways, heritage corridors, wild and scenic rivers, etc.). What are they?

parkways: scenic limited-access roads and highways on public land.

scenic byways: any paved road recognized by state (and soon a national) programs for their scenic qualities.

heritage corridors: multi-resource corridors recognized and established by Congress with start-up federal involvement, but long-term local management.

wild and scenic rivers: river segments recognized for unspoiled values, managed by state or federal agencies.

In some cases a corridor may be a little bit of each. An example is the Columbia River Gorge: it includes two national historic trail, a crossing of the Pacific Crest National Scenic trail, a parkway, several scenic byways, an acknowledged heritage corridor, and a pretty wild river.

Each of these types of corridor relies on partnerships for a variety of reasons: they cross many jurisdictions, they involve both government managers and local volunteers, they include a broad diversity of sites and resources, they involve many communities with their specific cultural orientations. If the partnership holding one of these corridors together stumbles, the corridor idea stumbles. In my view, the most important indicator of the success of a resource corridor project is the strength of its partnership organizations.

CONCLUSION: WAYS TO NURTURE SUSTAINABLE PARTNERSHIPS

So what is needed to sustain healthy partnerships, and what should be avoided to keep them from failing? (We have a wide range of success and failures just in the trails community.) The medicine for healthy partnerships includes **excellent** (not just good, but excellent) **communications** among all parties involved. An inspiring example of this is the 400-mile Bay Area Ridge Trail circling San Francisco Bay and crossing 70 jurisdictions.

In addition, a partnership organization has to be subtly **structured for stability** and to minimize the damaging effects of unsuitable egos. Sound board by-laws are extremely important so that everybody involved understands and plays by an accepted set of rules. Poor leadership and bad press can quickly run a vibrant organization.

Forgiveness. It is easy to get bent out of shape when your partner does something you didn't expect. Yet some of these partnerships, unlike a marriage, are forever. Differences will always occur. One way to minimize divergence is to periodically build a common vision that all parties agree to as common ground.

As a government player I am often troubled by the contrast between the command-and-control hierarchy needed for accountability and pay scales, and the informal teams that get the work done in partnerships. Can government be a full partner, or is it only comfortable when it is in control, scaring away others? I have seen enough excellent examples of enduring partnerships involving government at all levels that I am convinced that it can work. **Government brings stability, resources, and expertise.** It may lack passion, inventiveness,

and risk-taking. This shows to me that any partners have a double responsibility to make it clear what their skills and limits are, and to find out what the skills and limits of the other partners are.

I want to end by focussing on an attitude, that when it is present, seems to make miracles happen – be it along trails, or any of the other corridors we’re talking about here. When it is twisted, havoc reins. Partnerships must be seen as a **relationship of equals**, even if it consists of a small citizens group a giant government agency. If it is considered a subordinate relationship by one side or the other, it is likely to fail. The squashed party will grow resentful. I sometimes hear people say, “We don’t have enough funds, lets get some partners.” I’d rather hear, “We have a problem, who can help us.”

A partnerships of equals may even mean putting your non-profit partner first. Lots of government people still think that they have ultimate control. They are most comfortable with a mili-

tary-style hierarchy. Their partnerships tend to be authoritarian – “Volunteers, here are your assignments.” (Implying “We know best, and we have the upper hand.”) But more and more people prefer a task force mode of equal partners solving problems together – “Volunteers, how would you like to contribute?” (Acknowledging that everyone’s opinions and comments are welcome and will be respected.) Partners to trails partnerships need to be upfront and clear about their expectations, style, and roles, so that misunderstandings about control and “ownership” do not fester. Trails have proven to me that only partnerships equals are sustainable.

Thank you

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Managing the Visual Resource Quality of a Scenic Park

Sightseeing From the Pinnacle Overlook: Cumberland Gap National Historical Park

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INTRODUCTION

The Pinnacle Overlook of Cumberland Gap National Historical Park receives over 100,000 visitors per year. It serves as the dominant visitation locale, along with the visitor center, within the Park. The primary reason for the visitation to the Pinnacle Overlook is the excellent views it offers visitors of the scenic resources surrounding the Cumberland Gap area. The viewsheds offer visitors distant views of Fern Lake and adjacent forested mountains, as well as near views of historic Middlesboro.

In order to manage the quality of any resource, be it water quality, vegetation quality, and/or wildlife quality, the resource must be inventoried and evaluated. Visual resource quality is no exception. To manage the quality of visual resources, it is necessary to inventory the components of the visual resource, and to evaluate their quality. In the case of the visual resource as seen from Pinnacle Overlook, it is necessary to inventory the various viewsheds as seen from the Overlook and to arrive at some measure of their scenic quality. This information becomes useful in managing the existing condition of the visual resource, as well as any potential disturbances to the scenic resources of available viewsheds. Since sightseeing is the dominant activity at the Pinnacle Overlook, any major disturbance to the scenic resources of its viewsheds may impact the quality of visitor experiences

to Cumberland Gap, as well as impact the historic and scenic significance of the National Park.

It is hypothesized that one of the, if not the most, scenic viewsheds from the Pinnacle Overlook is of Fern Lake and the surrounding forested mountains. Water, in the form of lakes and rivers, is known to be the most preferred of viewsheds in mountainous areas (Noe and Hammitt, 1988). These are critical viewsheds to preserve from major forms of visual impacts.

A situation currently exists at Cumberland Gap National Historical Park for development of a coal strip mine within the Fern Lake viewshed. Although the proposed 214 acre mine would be located outside the boundaries of the Park, it would be developed within the Fern Lake viewshed as seen by over 100,000 visitors per year from the Pinnacle Overlook. The potential visual impact of the strip mine on the scenic quality of the Fern Lake viewshed is of concern to the National Park Service. The purpose of this study is to evaluate the visual quality of scenic resources of viewsheds as seen from the Pinnacle Overlook of Cumberland Gap National Historical Park. The project also investigates visitor reaction to a simulated strip mine within the Fern Lake viewshed.

METHODS

All sampling of visitors occurred at the Pinnacle Overlook of Cumberland

Gap National Historical Park. The main overlook platform served as the study site for intercepting Pinnacle visitors. Sampling occurred on-site at the Pinnacle and consisted of 210 respondents (completed photoquestionnaires). Only visitors over 15 years of age were asked to participate, with one member per couple or no more than two members per larger party participating in the sample.

Sampling occurred on the two week-ends of October 15 - 16 and 22 - 23, 1994. October was selected for sampling because the Fall foliage color season is one of the busiest visitation periods for the Overlook, and because there is far less atmospheric haze at this time, allowing for distant views.

Visitors were asked to rate photographs of viewsheds as seen from the Pinnacle Overlook by use of a photoquestionnaire. Fifteen (15) photo-viewsheds, including the Fern Lake viewshed with and without the simulated mine, were printed into a questionnaire. Directly below each photograph in the questionnaire was a 5-point Likert type scale for visitors to rate the scenic quality of each viewshed.

The 15 photos selected for the photoquestionnaire were generated by park personnel and Clemson University researchers. The 15 viewsheds selected represented a panoramic inventory of distant and mid-ground views as seen

from the Pinnacle Overlook. A tripod and 55 mm. lens were used to inventory the viewsheds.

RESULTS AND DISCUSSION

Scenic Resource Quality Ratings

The major purpose of this research was to inventory and evaluate the scenic resource quality of landscape viewsheds as seen from the Pinnacle Overlook. A landscape viewshed was defined as the content captured in a 55 mm. photograph, taken from the viewing point of the Pinnacle Overlook platform. On-site visitors to the Pinnacle Overlook were then asked to rate 15 representative photographs of the landscape viewsheds for scenic resource quality.

The percent of respondents indicating each of the five possible quality rating values, and the average (mean) ratings for each scene, are reported in Table 1. Figures 1 through 15 also display the mean quality ratings for the landscapes.

The average scenic quality ratings for the 15 viewsheds ranged from a low of 2.56 to a

high of 4.59. Six of the photos had average ratings of 3.99 or higher, indicating that visitors liked these landscape scenes "quite a bit" to "very much." Only two scenes (photo no.6 and 2) had mean ratings below 3, indicating that visitors liked these two scenes "a little." For both of these scenes, about 20% of respondents indicated they did not like the landscapes "at all" (Table 1). Overall, respondents rated the scenic resource quality of the



Photo #2

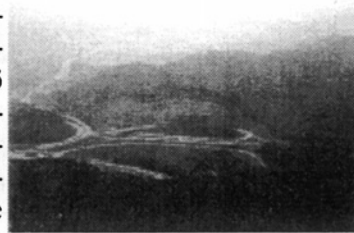


Photo #6



Photo #10

viewsheds rather high, with over one-half of the scenes rated 3.5 or higher on the 1 to 5 rating scale. However, there were individual scenes that were liked considerably more than others.

The most liked landscape viewshed FUNC (OVERLINE $\bar{x} = 4.59$) was photograph no.10, which was a background view of Fern Lake and surrounding mountains. Over 70% of visitors gave this scene a top rating of 5, indicating they liked it very much (Table 1). Past research in visual resource management has shown that water is a highly preferred element in landscapes, and Fern Lake

serves as a strong focal point, attracting the viewer's attention when viewed from the vantage point of the Pinnacle Overlook. It is the dominant background or distant viewshed present from the Pinnacle.

The second most liked viewshed FUNC (OVERLINE $\bar{x} = 4.52$) was photograph no.7, which was a foreground view of a forested, rock ledge near the Pinnacle Overlook platform. The scene also contained an element of pastoral scenery in the background of the viewshed. Landmark or unique features in a landscape are often preferred elements. Nearly 70% rated this scene a 5.

Photo no. 1 was rated third in quality FUNC (OVERLINE $\bar{x} = 4.40$). It is a background scene of Fern Lake,

nearly identical to photo no. 10. The scene does differ somewhat from photo no. 10 in that more of a mid-ground ridge is prominent in the left portion of scene no. 1.

The other viewshed with a mean quality rating above 4.00 FUNC (OVERLINE $\bar{x} = 4.19$) was photograph no. 5, a background view of a multi-ridged, mountainous landscape. The center of the scene is dissected by a highway, but is fairly hidden from view by the surrounding forest landscape.

The forest and mountains in the scene dominate the highway elements.



Photo #5

The three least liked scenes involved landscape viewsheds dominated by double-laned highways and their associated landscape construction (photo nos. 2, 6, 4). In particular, the extensive removal of forest vegetation adjacent to the highways creates a "highwall" effect when viewed from the Pinnacle Overlook. Nearly 50% of

visitors did not like these scenes, particularly scenes no. 2 and 6.

Viewsheds of the towns of Middlesboro and Cumberland Gap

(photos no. 8 and 11) were liked "somewhat" (OVERLINE $\bar{x} = 3.23$ and 3.16 , respectively). Thus, the scenic resource quality of these small town viewsheds were rated intermediate between the



Photo #7



Photo #1



Photo #4

highly preferred forest-mountainous landscapes and the least preferred highway development landscapes.

A final interpretation is needed concerning the viewsheds depicted in photographs no. 13, 14, and 15. An attempt was made to simulate a proposed coal strip mine in the Fern Lake viewshed. Photograph no. 14 was a control or unaltered scene. Photograph no. 13 had the coal mine simulated at one level of development and visual presence, while photograph 15 contained the mine at a more prominent level of visual presence. Unfortunately, winter scenes were the only photos available at the time of the simulation development, and thus, the three scenes different from the other 12 summer vegetation photos in the questionnaire. However, for the purpose of comparing the control photo (#14) with the two levels of mine development, the win-



Photo #8

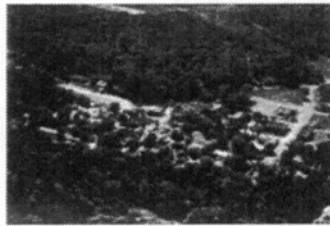


Photo #11



Photo #13



Photo #14



Photo #15

ter scene is the same. Therefore, any difference in scenic quality rating among the three winter scenes of Fern Lake could be attributed to the mine simulations. Examination of the mean ratings for photographs 13, 14, and 15 show that scenic quality was highest for the control scene of Fern Lake (photo no. 14, OVERLINE $x = 3.83$); followed by photo no. 13, (OVERLINE $x = 3.42$) which included the lower level of mine development; and was lowest for photo no. 15 (OVERLINE $x = 3.20$), which contained the greatest level of mine stimulated development. Thus, visitor reaction to the stimulated coal mine development in the Fern Lake viewshed varied in a predictable pattern, meaning that scenic resource quality for the viewshed decreased as the coal mining simulation increased. Visitors were evidently reacting to the visual presence of the disturbed area in the simulated photographs, as researchers deliberately did not instruct nor identify for respondents what the simulations represented during the on-site survey. If the simulations had been identified as coal strip mine development, the scenic resource quality ratings for these scenes would have likely been influenced by visitor attitudes toward strip mines. Thus, we did not want to confound the scenic resource quality ratings for viewsheds with attitudinal biases.

Table 1. Scenic quality ratings for landscape scenes viewed from the Pinnacle Overlook at Cumberland Gap National Historical Park, 1994 (N = 210).

Photo Number	Scenic Quality Rating (%) ¹					Mean (OVERLINE x) Rating
	1	2	3	4	5	
10	1.4	1.0	6.2	20.5	71.0	4.59
7	1.4	2.9	7.1	19.0	69.5	4.52
1	0.5	2.9	11.9	25.7	59.0	4.40
5	2.4	2.9	13.8	35.7	45.2	4.19
3	1.9	4.8	23.3	32.4	37.6	3.99
9	2.99	7.1	14.3	40.0	35.7	3.99
14	5.2	8.6	21.4	27.6	37.1	3.83
12	5.7	7.6	18.1	36.2	32.4	3.82
13	7.6	15.2	24.8	26.7	25.7	3.42
8	5.7	20.1	31.1	31.1	12.0	3.23
15	13.3	19.5	23.8	21.0	22.4	3.20
11	11.0	16.7	31.1	27.3	13.9	3.16
4	11.4	17.1	37.1	27.1	7.1	3.01
6	20.5	24.3	29.5	15.2	10.5	2.71
2	22.4	29.0	27.6	12.4	8.6	2.56

¹Percent of respondents rating each category, where 1 - liked scene not at all, 2 = a little, 3 = somewhat, 4 = quite a bit, 5 = very much. Mean ratings were based on the 5-point scale.

FIGURES 1 - 15. Average rating values (FUNC OVERLINE x) and standard deviations (S.D.) for scenic quality (liking) of landscape scenes at Pinnacle Overlook, 1995.

Photo 1
Liking
FUNC OVERLINE
x = 4.40
S.D.=0.84

Photo 6
Liking
FUNC OVERLINE
x = 2.71
S.D.=1.25

Photo 11
Liking
FUNC OVERLINE
x = 3.16
S.D.=1.19

Photo 2
Liking
FUNC OVERLINE
x = 2.56
S.D.=1.21

Photo 7
Liking
FUNC OVERLINE
x = 4.52
S.D.=0.86

Photo 12
Liking
FUNC OVERLINE
x = 3.82
S.D.=1.14

Photo 3
Liking
FUNC OVERLINE
x = 3.99
S.D.=0.99

Photo 8
Liking
FUNC OVERLINE
x = 3.23
S.D.=1.08

Photo 13
Liking
FUNC OVERLINE
x = 3.48
S.D.=1.24

Photo 4
Liking
FUNC OVERLINE
x = 3.01
S.D.=1.09

Photo 9
Liking
FUNC OVERLINE
x = 3.99
S.D.=1.02

Photo 14
Liking
FUNC OVERLINE
x = 3.83
S.D.=1.17

Photo 5
Liking
FUNC OVERLINE
x = 4.19
S.D.=0.94

Photo 10
Liking
FUNC OVERLINE
x = 4.59
S.D.=0.77

Photo 15
Liking
FUNC OVERLINE
x = 3.20
S.D.=1.34

SUMMARY AND CONCLUSIONS

Visual resource management is an important component of comprehensive park management. Also, sightseeing is often a dominant activity among visitors to parks. Such is the case at the Pinnacle Overlook at Cumberland Gap National Historical Park, where people concentrate to view the scenic resources of the surrounding area. However, visual resource management, like any form of resource management, requires that the resource (scenic in this case) be inventoried and its quality evaluated, in order for efficient management to occur.

The purpose of this research was to inventory and evaluate the visual quality of the scenic resources of viewsheds as seen from the Pinnacle Overlook of Cumberland Gap National Historical Park. In October of 1994, 210 on-site visitors to the Pinnacle Overlook were surveyed using a photoquestionnaire. Visitors rated 15 photographed, landscape viewsheds for scenic quality, and provided additional information concerning activity use patterns, past use history, and visitor characteristics. Following is a summary of the major results and some conclusions drawn from the study.

Inventory and Scenic Resource Quality of Viewsheds

The inventory of viewsheds from the Pinnacle Overlook consisted of four major landscape themes: distant views of Fern Lake, and the surrounding forested, mountainous ridges; mid-ground views of forested areas and rock ledges; small-town views of Middlesboro and Cumberland Gap; and viewsheds of highways and roadside landscape.

The most scenic viewshed to visitors of Pinnacle Overlook was a view of Fern Lake and the surrounding mountainous landscape. Approximately 70% of visitors give the Fern Lake viewshed the highest rating on the 5-point rating scale used to evaluate scenic quality. The landscape theme rated second in quality was that involving mid-ground views of forests and rock outcrop-ledges. Least in scenic quality were the viewsheds with double-laned highways and associated roadcuts. Based on the data, it is concluded:

The Fern Lake viewshed, as seen from the Pinnacle Overlook at Cumberland Gap National Historical Park is the most prominent and scenic visual resource, according to visitors of the area.

Effect of Simulated Strip Mine on Scenic Quality

The two levels of coal mine development that were simulated in the Fern Lake viewshed decreased the scenic quality ratings for it. The simulations did not decrease scenic quality a large degree, however, the simulation with the greater level of visual prominence did cause the lower ratings in scenic quality. Our preliminary, simulated evaluation of the possible scenic effect of the proposed strip mine near Fern Lake do not allow for drawing any definite conclusions. We can conclude that:

The simulated strip mine in the Fern Lake viewshed decreased the scenic resource quality of the viewshed, but it could not be determined from the simulations if the decrease was significant.

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1995

Congress and the Establishment of the Great Smoky Mountains National Park, 1926-1934

Philip A. Grant, Jr., Bronxville, NY

On April 14, 1926 Congressman Henry W. Temple of Pennsylvania introduced a bill to establish the Great Smokey Mountains National Park. The Temple Bill also provided for the creation of the Shenandoah National Park in Virginia.¹

The Temple Bill was promptly referred to the House Committee on Public Lands, a panel which exercised jurisdiction over national parks. After scrutinizing the bill for more than three weeks, the Public Lands Committee issued a report in favor of its passages.²

A bill identical to the Temple measure was offered on April 23, 1926 by senator Claude A. Swanson of Virginia. The Swanson Bill was co-sponsored by the two senators from North Carolina and the two senators from Tennessee.³

The Swanson Bill was immediately submitted to the Senate Committee on Public Lands and Surveys. Twenty days later the Public Lands and Surveys Committee unanimously agreed that the bill was deserving of approval.⁴

On May, 13 the Senate debated the Swanson Bill for less than ten minutes. Explaining that the bill was "simply an enabling act," Swanson emphasized that the bill would "cost the Government nothing." Swanson asserted that the federal government would acquire title to a minimum of one hundred and fifty thousand acres in the Great Smoky Mountains. Assuring his colleagues that the government would "not have to pay any money whatsoever for the lands the Virginia senator concluded that the bill did

"not become operative until the acreage of land mentioned has been donated to the Government." After hearing Swanson's remarks, the Senate passed the bill by voice vote.⁵

The House of Representatives on May 14 decided to consider the merits of the Swanson Bill. Congressman Temple, pleased that the State of Tennessee had already contributed about three hundred thousand dollars to the proposed Great Smoky Mountains National Park, predicted that the State of North Carolina would appropriate between a million and a half and two million dollars to the park. As to the projected size of the park, Temple estimated that from six hundred to six-hundred and forty square miles would be included within its boundaries. Believing that as much as five million dollars in voluntary contributions would be accumulated in the near futures, Temple contended that the government should be very happy to secure the park "on the terms which it is getting them."⁶

The Great Smoky Mountains National Park Bill was signed into law by President Calvin Coolidge on May 11, 1926. The relevant portions of the text of the law were as follows:

...That when the lands hereafter referred to have been vested in the United States in fee simple, there shall be, and are hereby established, dedicated and set apart as public parks for the benefit and enjoyment of the people...the tract of land in the Great Smoky Mountains in the

States of North Carolina and Tennessee being approximately 704,000 acres, recommended by the Secretary of the Interior in his report of April 11, 1926, which area, or any part or parts thereof as may be accepted in behalf of the United States in accordance of the provisions hereof, shall be known as the Great Smoky Mountains National Park...

SEC. 2. The Secretary of the Interior is hereby authorized, in his discretion, to accept as hereafter provided on behalf of the United States title to the lands referred to in the previous section hereof and to be purchased with...the \$1,066,693 which has been subscribed by the State of Tennessee and the Great Smoky Mountains Conservation Association and the Great Smoky Mountains (Incorporated) (North Carolina) and with other contributors for the purchase of lands in the Great Smoky Mountains National Park area.⁷

During the seven years between 1926 and 1933 the States of North Carolina and Tennessee purchased substantial amounts of land from their respective portions of the Great Smoky Mountains. Also participating in the process of land acquisition were numerous private citizens and organizations. The most significant contribution involved a 1928 gift of \$5,000,000 by John D. Rockefeller, Jr. The avowed objective was to transfer title to the land within the confines of the Great Smoky Mountains to the National Park Service.⁸

By early 1934 it appeared certain that the Great Smoky Mountains National Park would soon become a reality. Accordingly, on January, 25 1934 Congressman Zebulon Weaver of North Carolina introduced a bill to supercede

the 1926 statute. Weaver, serving his eighth of fourteen terms on Capitol Hill, represented a district consisting of twelve counties in the extreme western part of North Carolina.⁹

The Weaver Bill, endorsed by Secretary of the Interior Harold Ickes, without delay was approved by the House Public Lands Committee. Brought to the House floor for consideration on April 16, 1936, the bill was routinely passed without the formality of a roll call.¹⁰

As in the House, the Senate exhibited a willingness to expedite enactment of the Weaver Bill. The bill was favorably reported by the Senate Public Lands and Surveys Committee on May 24 and without any discussion was passed in the Senate chamber on June 6.¹¹

The Weaver Bill became law on June 15, 1934, on which date President Franklin D. Roosevelt affixed his signature to the measure. The Weaver Bill stipulated:

That an area of 400,000 acres, within the minimum boundaries of the Great Smoky Mountains National Park, acquired one half by the peoples and States of North Carolina and Tennessee, and one half by the Laura Spelman Rockefeller Memorial in memory of Laura Spelman Rockefeller, be, and the same is hereby, established as a completed park for administration, protection, and development by the United States, and so much of the Act of May 26, 1926...as is inconsistent herewith is herewith repealed.¹²

A modest expenditure of federal funds for the Great Smoky Mountains National Park was included in the Department of the Interior Appropriation Act of 1934. The Interior Department Appropriation Bill was introduced on

January 16, 1934. Within seven weeks the bill had been passed by both the House and Senate. A minor provision of the Department of the Interior Appropriation Act read:

Proposed Great Smoky Mountains National Park: For administration and protection of the portion of the area of such proposed park of which has been vested in the United State... including not to exceed \$300 for the maintenance, operation and repair of motor-driven passenger-carrying vehicles for use in conjunction with

such work, \$22,270.13

While the Great Smoky Mountains National Park was not officially dedicated until 1940, its actual establishment occurred during the period between 1926 and 1934. The park's creation was obviously enhanced by the sustained cooperation between two states, North Carolina and Tennessee, and the United States Government. The Great Smoky Mountains National Park was destined to be the most popular and well-known national park east of the Mississippi River.

¹House of Representatives, H.R. 11287-A bill to provide for the establishment of the Shenandoah National park in the State of Virginia and the Great Smoky Mountains National Park in the States of North Carolina and Tennessee, and for other purposes, April 14, 1926; Bruce A. Ragsdale and Kathryn A. Jacob (eds.), Biographical Directory of the American Congress, 1774-1989 (Washington: United States Government Printing Office, 1989), pp. 1920-1921.

²House of Representatives, Report Number 1160, May 11, 1926.

³United States Senate, S. 4073-A bill to provide for the establishment of the Shenandoah National Park in the State of Virginia and the Great Smoky Mountains National Park in the States of North Carolina and Tennessee, and for other purposes, April 23, 1926; George C. Farnum, "Claude Augustus Swanson," Dictionary of American Biography, Supplement Two (New York: Charles Scribner's Sons, 1958), pp. 643-644; Henry C. Ferrell, Jr., "Claude Augustus Swanson," Encyclopedia of Southern History (Baton Rouge: Louisiana State University Press, 1979), p. 1172.

⁴United States Senate, Report Number 824, May 13, 1926.

⁵United States Congress, Congressional Record (Washington: United States Government Printing Office, 1926), LXVI, 9362; Post, Washington, D.C., May 14, 1926, p. 9.

⁶Congressional Record, LXVI, 9451-9452; Times, New York, N.Y., May 15, 1926, p. 15; Post, Washington, D.C., May 15, 1926, p. 4.

⁷The Statutes at Large of the United States of America, 1925-1927 (Washington: United States Government Printing Office, 1927), XLIV, 616-617; Michael Frome, Strangers in High Places: The Story of the Great Smoky Mountains (Knoxville: University of Tennessee Press, 1966), p. 189; Times, New York, N.Y., May 23, 1926, p. 16.

⁸Albro Martin, "John Davidson Rockefeller, Jr." Dictionary of American Biography, Supplement Six (New York: Charles Scribner's Sons, 1980), pp. 547-549; Times, New York, N.Y., May 25, 1927, p. 37; June 24, 1927, p. 40; March 7, 1928, pp. 1, 10; March 24, 1928, IV, 6; June 2, 1929, VIII, 10; August 13, 1929, p. 9; February 8, 1931, p. 4; April 7, 1931, p. 25; May 2, 1931, X, 13; September 27, 1931, II, 1; November 2, 1931, p. 21; November 3, 1931, p. 30; November 14, 1932, p. 40; June 29, 1933, VIII, 3; July 19, 1933, p. 9.

⁹H.R. 7360-A bill to establish a minimum area for the Great Smoky Mountains National Park, and for other purposes, January 25, 1934; Kenneth C. Martis, The Historical Atlas of United States Congressional Districts, 1789-1983 (New York: The Macmillan Company, 1982), p. 257.

¹⁰House Report 982, March 15, 1945; Congressional Record, LXXVIII, 6687.

¹¹Senate Report 1155, May 24, 1934; Congressional Record, LXXVIII, 10594.

¹²Statutes at Large, XLVIII, 964.

¹³H.R. 6951-A bill making appropriations for the Department of the Interior for the fiscal year ending June 30, 1935; and for other purposes, January 16, 1934; House Report 839, February 23, 1934; Senate Report 286, February 10, 1934; Congressional Record, LXXVIII, 3067, 3117-3120; Statutes at Large, XLVIII, 362-395.

National Parkways: A Demonstration of Sustainable Design and Management

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Abstract

Many people talk about promoting environmental quality and biodiversity as if humans are somehow separated from the quality and diversity they are seeking. Unfortunately, this attitude and our activities are the cause of worldwide environmental degradation. If only we all had the keen understanding of the interrelationships of our natural systems as Aldo Leopold, the father of ecology, who in 1948 wrote, "We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect." Now that we are in the middle of the "environmental decade," it is time that we realize that our very existence directly relates to our every action. Indications of change are evident by the recent inclusion of the concept of sustainability when creating and managing human environments.

In 1991, the National Park Service (NPS) headed a partnership of allied public and private professionals to establish the Sustainable Design Initiative that will guide the development and management of all national parks. Being recognized as a leader in environmental stewardship, the NPS intends for the Sustainable Design Initiative to serve as a model for all types of development.

This paper examines the principles and methodologies behind the Sustainable Design Initiative and its comprehensive approach to planning, design, construction and management. These methods are demonstrated by exploring their practical application to our national parkways.

SUSTAINABILITY:

CONCEPTS AND PRINCIPLES

We find ourselves in an exciting time of new emerging sciences and changing attitudes of social responsibility. More and more frequently we find ourselves confronted with the term "sustainability". Sustainable design, sustainable communities, sustainable development, sustainable resources are all commonly used phrases. It seems that by placing the word "sustainable" before most nouns, we imply some degree of stewardship to the environment and make the noun more palatable.

What does sustainability mean? Like any immature concept, there is much theoretical confusion and debate over appropriate definitions, concepts, principles and applications of sustainability. The following paragraphs offer some of the related concepts and principles that assist in forming a definition for sustainability.

- Landscape architect, planner and philosopher, Ian McHarg writes, "All systems aspire to survival and success.....The best and most efficient system is one that requires a minimum of work and adaptation. Such an approach is not limited by scale. It may be applied to locating plants within the garden as well as the development of a nation."
- Ecologist, Eugene Odum, equates human cities as a parasite on the natural environment. To maintain their existence, the cities (parasites) require vast quantities of resources from the surrounding environment (host) to support their existence. Our environ-

ment acts as the host for these parasites. We know from examples in nature that parasites do not live long if they damage their host. A symbiotic relationship develops when the parasite provides benefit and positive exchanges between the host.

- The related concept of bioregionalism contends that life is created and maintained in a community basis where each community shares a mutual life support system. The communities in each bioregion are sustainable since they do not harm neighboring regions or the common life supporting systems.
- I recently had the opportunity to listen to Mr. Andy Houston, FAIA, who described sustainability as the union of three concentric forces: the environment, the economy and the social foundation. He contends that sustainability is found in the common overlap of these forces. Development often favors the economic and social aspects thus pulling away from the convergence of these three forces and missing the opportunity to be sustainable.

As you can gather, there is no universal consensus on a definition of sustainability. We recognize that human environments are part the natural system which is comprised of numerous complex and intertwined relationships. We agree that our natural system serves as our life support and directly relate to our survivability. Our common goal is to sustain the life supporting abilities of our natural systems over time. If we can achieve a sustainable society, the potential for human survivability is unlimited.

Achieving global sustainability is the most complex and important problem facing the world today. It is far too complex for any one nation to solve and will

require a global network of partnerships. We are beginning to see professional partnerships align to promote sustainability. In 1993, the International Union of Architects adopted the "Declaration of Interdependence for a Sustainable Future." In addition, the Interprofessional Council on Environmental Design, comprised of architects, landscape architects and engineers developed a vision statement that read, "The ethics, education and practice of our professions will be directed to shape a sustainable future through a multidisciplinary partnership."

NPS SUSTAINABLE DESIGN INITIATIVE

In October of 1991, the NPS celebrated its 75th anniversary by holding a symposium in Vail, Colorado. The event collaborated the minds of some 700 experts and interested parties to deliberate the future of the NPS. The findings were published in the *Vail Agenda* which identified unprecedented challenges and set the foundation for the NPS to march into the 21st century. The outgrowth of the *Vail Agenda* launched many new policies; none more crucial than the Sustainable Design Initiative. The NPS views the Sustainable Design Initiative as a vehicle to adapt to the increasing pressures and demands without compromising values and quality. Shortly after the symposium in Vail, the Sustainable Design Initiative was officially christened. In November of 1991, a forum was held that included representatives from a wide range of government agencies, design professionals, environmental groups and resource and facility managers. This diverse partnership of professionals met to develop a broad based set of principles that would provide practical advice to anyone responsible for managing human activity within areas

rich in natural and cultural resources. In September of 1993, after nearly two years of dedicated labor, the *Guiding Principles of Sustainable Design* was published by the National Park Service. This document is geared to serve as a guide to achieve sustainability when designing and managing facilities within sensitive environments.

SUSTAINABLE DESIGN INITIATIVE: CHANGES AND IMPLICATIONS IN THE WAY WE DO BUSINESS

Traditionally, development projects of all kinds have been centered on meeting the needs of the human users. Emphasis is placed on their convenience, functionality, and comfort. These artificial environments are often created at the expense of the natural environment. We rationalize this practice by employing mitigation measures which have come to serve as a disguise for sustainability. Saving the largest tree on the site does not mitigate the loss of the surrounding forest. This is just one example that is common in our communities and exemplifies how we as a society have become comfortable into thinking that we are environmentally conscious.

Sustainable development differs from traditional development by shifting the emphasis from providing human convenience and comfort to protecting and preserving the natural systems. When the natural systems are preserved instead of mitigated, we have sustainable development.

Traditionally the strategy has been to maintain the existing level of environmental quality. The sustainable approach to redevelopment would counter with the idea to repair, restore and enhance the existing level of environmental quality as a part of the new project.

Traditional development focused

within the boundaries of the project. Sustainable development maintains no boundaries. Understand the impacts that the project will have on the region. A truly sustainable project is not created at the expense of another location.

Landscapes need to be treated as interconnected systems. Linear parks are often surrounded by urban development and serve as the primary means for animal migration. Biodiversity should be enhanced by reconnecting fragmented habitats and establishing large contiguous natural areas.

The sustainable approach extends beyond analysis of site inventories by attempting to determine the relationships between site factors and hypothesize how they will change over time.

These are just some examples of how the NPS Sustainable Design Initiative is challenging our thinking and methods. As always, other forces such as funding, manpower and human health and safety also have become part of the equation that drives project development.

SUSTAINABLE DESIGN INITIATIVE: APPLICATIONS IN THE FIELD

Sustainable concepts, principles and methods are being incorporated into current NPS projects at all stages of the process. The examples presented below all pertain to current work on the George Washington Memorial Parkway, The Baltimore Washington Parkway, and the Suitland Parkway. These parkways are major linear parks that support a variety of transportation, recreation and environmental functions within the Nation's Capital. The increased demand to become commuter roads as opposed to pleasure roads has placed new pressures on the individuals responsible for their management. As a result, work is underway to improve driver safety and

to ease congestion at critical points. In carrying out the parkway improvement projects, we have been working to incorporate the ideals of the Sustainable Design Initiative throughout the planning, design, construction and management stages. The following examples are representative of practical applications where the Sustainable Design Initiative is influencing design, construction and management operations.

Resource Management

After review of the parkways, it was evident that a great deal of resources both financial and environmental were lost in the maintenance practices. In particular, mowing was found to be far more extensive than required and contributing to the fragmentation of habitats (see table 1). This important conclusion has been a topic in all of the parkway projects and has resulted in a significant reduction in the frequency and the extent of mowing. This is one case where the NPS is able to do more with less. Large areas have been taken out of the traditional mowing cycle and are either being reforested, converted to native eastern meadows or simply mowed on a annual basis (see table 2).

Reforestation Efforts to reforest large areas are underway on three of the parkways within the Nations Capital. Candidate areas are evaluated based on soil type, size and opportunity to expand existing forest and enhance habitat corridors. There remains much debate concerning the most appropriate method to reforest areas along the parkways. Recommendations on planting densities range from as many as 17,000 to as few as 200 plants per acre. Due to the lack of consensus and the variation in funding available on projects, several strategies are being implemented. Three

methods are described as follows:

- 1) The NPS maintains a cooperative agreement with the Natural Resources Conservation Service (formerly the Soil Conservation Service). The agreement allows NRCS to collect native indigenous seed from the site, propagate the plants and return them to the site for planting near the conclusion of the development project. This process is currently underway on the George Washington Memorial Parkway and includes collection of seed from an endangered plant species known to occur in only one other location in the state. This type of reforestation is costly and requires up to three years of pre-planning but is the purest method to maintain true native material.

- 2) Another reforestation effort is being used on the Baltimore Washington Parkway which involves the use of regionally native, commercially available nursery stock. The selected areas are tilled to loosen the soil and covered with 4-6 inches of shredded wood chips to minimize erosion and limit invasion by exotic species. Next, the area is staked in a 20 foot by 25 foot grid pattern. Within each grid, 17 of the same dominant hardwoods and 3 understory species are planted. Plants are spaced in a random pattern to achieve a density of 1700 plants per acre. Areas using this method have been found to have a survivability rate of up to 95% after the first year.

- 3) A third method was recently employed on the George Washington Memorial Parkway and was undertaken as a community partnership effort. In addition to the NPS, the Federal Highway Administration, the National Tree Trust and local boy scout and church groups combined efforts to reforest approximately 2 acres with 1400 trees. One of the areas borders the Boundary Chan-

nel which is a major migration path and habitat area for water fowl. Most of the trees were supplied free of charge through the National Tree Trust. This non profit organization was established to foster public and private partnerships to improve environmental and aesthetic quality along transportation corridors.

Native Eastern Meadows In addition to reforestation, the NPS is establishing native wildflower meadows in selected locations. Reduced fuel consumption, lower maintenance requirements, increased wildlife habitat and improved aesthetic values all contribute to make meadows a desirable alternative to turfgrass. Seed mixes are specifically designed for the soil conditions found within the targeted meadow areas. Each seed mix contains 18 to 20 species of regionally native herbaceous plants. Specific sites have been selected based on their size, relationship to the parkway, immediate adjacent conditions, and their ratio of perimeter to area. Meadows with large perimeters and little area are subject to a more rapid rate of invasion by aggressive exotics. As of this writing, nearly 10 acres of native eastern meadows are planned to be implemented on the Baltimore Washington Parkway during the Spring of 1996.

Revisions to Standard Maintenance Practices

A third method to reduce mowing has been incorporated into the maintenance program for the Suitland Parkway. In this case a mowing hierarchy was created which designated regularly mowed areas, annually mowed areas and no mow areas. The establishment of planned mow lines actually improved aesthetic quality by creating interesting patterns and adding color and texture to the landscape.

ENGINEERING AND CONSTRUCTION

Recently a 1.4 mile portion of the George Washington Memorial Parkway, was reconstructed where the existing concrete road was badly deteriorated. The traditional first step in this process would have been to remove the existing concrete from the site, place 8-10 inches of compacted base material and overlay with a total of 5 inches of asphalt. As a sustainable alternative, we proposed to rubblize the existing concrete. This process requires the services of specialized equipment which breaks the concrete road slabs into small sections, thus creating a flexible base for the new road bed. The recycled concrete base was topped with recycled asphalt which provided a level aggregate base for the final paving surface. By recycling the existing concrete the need to haul away the old material and bring in new material was eliminated. This conserved resources, reduced pollution from fossil fuels, saved time and greatly reduced the cost of the project. People are often opposed to using sustainable methods because they are believed to be more costly. This is a good example where using sustainable practices yielded a cost savings of nearly \$100,000.

CONCLUSION

Since its inception in 1872, the NPS has strived to be an environmental steward and to preserve the pristine environments under their jurisdiction for the use and enjoyment of current and future generations. There has been much success, some failure and plenty of room for improvement. The Sustainable Design Initiative is one improvement that is changing the way that the National Park Service thinks and carries out its mission. With new technologies, an ex-

panding information base and proactive policies, the horizon is filled with exciting challenges.

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Table 1
Summary of Parkway Mowing Practices

	George Washington Memorial Pkwy	Balt-Washington Parkway	Suitland Parkway
Mowing Frequency	12 Times per Year	12 Times per Year	12 Times per Year
Mowing Season	April - September	April - September	April - September
Mowable Acres	1,095	949	125
Total Annual Acres Mowed	13,150	11,392	1,500
Annual Person Days	1,291	1,119	147
Amount of Fuel Consumption (gal)	18,410	15,948	2,100
Estimated Annual Fuel Costs	\$22,092	\$19,138	\$2,520
Annual Labor Costs (Wages and Benefits)	\$197,250	\$170,880	\$22,500
Estimated Annual Costs (Labor and Fuel)	\$219,342	\$190,018	\$27,020

Notes

1. Figures were interpolated from data provided by park maintenance departments
2. Figures to not include hand trimming
3. Costs do not include equipment maintenance and transport costs.

Table 2
Reductions in Mowing Through Sustainable Management Practices

	George Washington Memorial pkwy	Balt-Washington Parkway	Suitland Parkway
New Reforestation (acres)	5	40	0
New Native Eastern Meadows (acres)	0	10	0
Revised Mowing Practice (selective mowing patterns in acres)	0	100	40
Total Annual Reduction in Mowing (acres)	60	1,800	480
Total Annual Reduction in Person Days	6	173	46
Total Annual Reduction in Fuel Consumption (gal)	84	2,520	672
Total Annual Reduction in Fuel Costs	\$101	\$3,024	\$806
Annual Reduction in Labor Costs	\$900	\$27,000	\$7,200
Estimated Total Annual Reduction in Costs (labor and fuel)	\$1,001	\$30,024	\$8,006

Keynote Address

by M. Rupert Cutler, Ph.D., Virginia's Explore Park, Roanoke, VA

The silver lining—at least for me—in the dark cloud represented by the last-rru'nute inability of Appalachian Regional Commission Co-Director Jesse White to speak to us this evening is the opportunity afforded me to stand in for him and exercise the privilege of a keynote speaker: To take a broad, philosophical view of the conference theme. So much, then, for the notes on Explore Park's many partners I'd planned to refer to in my original program slot on Tuesday morning. They'd be too narrowly focused.

Instead, I've hastily gleaned from my personal library on the history of the National Park Service and on linear parks, trails and rivers in general some of my favorite views by leaders in the fields of park administration, architecture, landscape architecture and ecology over the years, for your consideration. I'm hopeful that these thou-hts, together with a summary of the political environment in which we park people find ourselves today, will remind us of both the philosophical underpinnings of our work—why we're here—and current pressures on linear parks—or where we may be headed. My coal is to set the stage for our important deliberations over the next three days.

Reflecting on the state of the National Park System brings to mind the expression attributed to Yankees Manager Yogi Berra, "deja vu all over again." Forty-two years ago, as a student reporter for the University of Michigan student newspaper, *The Michigan Daily*, I interviewed the then Assistant Chief Naturalist of the National Park Service, Howard H. Gregg, who was on campus to speak on "Nature and Antiquity in the

National Parks." Here, *ver batim*, is the concluding paragraph of my report, published in *The Michigan Daily* on December 10, 1953:

"A recent statement by Bernard DeVoto was read by Gregg: 'It's time to shut down our National Parks until we can afford to rehabilitate them.' He added that this may come to pass if the Federal Government doesn't reverse its trend toward economizing by cutting the Park Service's budget."

Word out of Washington, DC today is that the National Park Service's next operating budget will not be enough to keep up with the effect of inflation and that its construction budget—critically important to the Blue Ridge Parkway—may be cut by 50 percent. Economies associated with the closing of regional offices and the shifting of personnel and other resources from big administrative offices to the parks has some potential to make up the difference, but there's only so much blood in that turnip—as current proposals to completely close some parks and turn others over to the states for administration prove.

Our Nation's scenic and cultural "crown jewel" national parks and the thin and fragile golden chains that connect them and provide wildlife and human travel corridors, such as the Blue Ridge Parkway, appear to be at risk now as never before. Only concerted, coordinated efforts by politically active people such as yourselves all across this land will halt and reverse this trend.

Fortunately, there are hopeful signs that such a grassroots defense of linear and other parks is afoot and becoming increasingly effective. Good examples include the recent activities of the Coa-

lition for the Blue Ridge Parkway and the Friends of the Blue Ridge Parkway. Let's take a look back in history and reflect on the views of those in whose footsteps we walk today—our trailblazers.

Robert Sterling Yard was Chief of the Educational Division of the National Park Service when he wrote *The Book of the National Parks* in 1919. (Later he headed—perhaps I should say he *was*—the staff of The Wilderness Society.) In the book cited, Yard provides this definition of national parks:

"The national parks of American include areas of the noblest and most diversified scenic sublimity easily accessible to the world; nevertheless it is their chiefest glory that they are among the completest expressions of the earth's history. The American people is waking rapidly to the magnitude of its scenic possession; it has yet to learn to appreciate it."¹

Bob Yard's observation that the American public "has yet to learn to appreciate" the value of its parks was restated exactly 30 years later by Aldo Leopold in his inspired and inspirational work, *A Sand County Almanac*, in which he wrote that "[t]o promote perception is the only truly creative part of recreational engineering.... Recreation ... is not the outdoors, but our reaction to it [, and t]he only true development in American recreational resources is the development of the perceptive faculty in Americans."²

Therein lies the continuing challenge for park interpreters: To develop the perceptive faculty in Americans. In other words, after a park is acquired and its physical development is completed, the real task begins: to promote perception. And what are some of the "perceptions" that must be communicated to park visitors? Listen to an architect,

Nathaniel Alexander Owings, in his book *The American Aesthetic*:

"If we are to sustain a healthy balance of life in this country, we must preserve our natural resources, allowing animal and bird life as much right to exist as we do human life. To many this must seem like sentimentality. To those who have taken the effort to find out, it is clearly a matter of life and death for *all of us*. This is true not only biologically, but psychologically as well. Man needs enormous areas, unscarred by his own kind, as a primary source of spiritual recharging, and this need is as great as his requirement for material sustenance."³

Listen to a landscape architect, Ian L. McHara, in his book *Design With Nature*:

"Our eyes do not divide us from the world, but unite us with it. Let this be known to be true. Let us then abandon the simplicity of separation and give unity its due. Let us abandon the self-mutilation which has been our way and give expression to the potential harmony of man-nature. The world is abundant, we require only a deference born of understanding to fulfill man's promise. Man is that uniquely conscious creature who can perceive and express. He must become the steward of the biosphere. To do this he must design with nature."⁴

And if we don't design with nature? What then? One response is described in Edward Abbey's book, *The Monkey Wrench Gang*, in which the protagonist, George W. Hayduke—en route to trying to blow up Glen Canyon Dam—takes to time to savor wild nature:

"The heron in the canyon, a bighorn ram on the cliff above, one lean coy-

ote on the rim across the river hear the sound of a howl, the song of a wolf, rise in the twilight stillness and spread through the emptiness of the desert evening. One long and prolonged, deep and dangerous, wild archaic howl, rising and rising and rising on the quiet air.”

The psychological importance of parks to people has been described not only by the radical Ed Abbeyes of the world but by more mainstream writers and speakers. For example, in 1981 the National Parks and Conservation Association sponsored a conference in Jackson Hole, Wyoming on problems in the National Park System that resulted in the publication by the NPCA in 1982 of a book entitled *National Parks in Crisis*. And the very first piece of text in that book is a quote attributed to Luray, Virginia’s own Darwin Lambert:

“Visits to national park areas have multiplied threefold in less than a Generation. Far more of us than ever before walk in wilderness now and time-travel in history simultaneously. As we enjoy and save our parks, building their defenses in our hearts, the parks help save us. Interconnections form in our depths. The pattern of the whole grows stronger. We hear again the great orchestra of earth and fife, and our spirits begin again to sing, tentatively yet, but more and more in harmony.”⁶

I didn’t have the good fortune to ever meet and talk with John Muir or Frederick Law Olmstead or Aldo Leopold, but I did meet a few of the “greats” in our business before they left us, such as Sig Olson, Howard Zahniser and Benton MacKaye. Sig fought to save the wildness of the Quetico-Superior canoe country. Zahniser saw the need for a statutory federal wilderness system and

wrote the Wilderness Act. And Benton MacKaye was the inspiration for the Appalachian Trail, the epitome of a linear park. MacKaye, with whom I spoke at his home in Shirley Center, Massachusetts back when I was a Wilderness Society staff member, was quoted on the cover of the November/December 1985 *Appalachian Trail News* as saying:

“I pictured a mile-high giant walking along the Appalachian range ... If he could now speak. . . he would note signs of man’s power that he did not note before, a power to retain, despite the inroads of a metropolitan civilization, a crucial portion of our original primeval America”⁷ (by which he meant the Appalachian Trail).

This quote is from a letter he wrote to Stan Murray, chairman of the ATC Board of Managers, in 1969. In it MacKaye—who first described the AT concept in an article in the October 1921 number of the *Journal of the American Institute of Architects*—complimented the volunteers who had labored to bring his dream to fruition for their “half-century of devotion and accomplishment”.

Then came the Blue Ridge Parkway, the origins of which you heard described this afternoon by Carlton Abbott in his beautifully illustrated presentation, “Blue Ridge Parkway: Designing a Ribbon in the Sky.” The Blue Ridge Parkway became the model for other linear parks across the nation and around the world.

The finesse with which it was designed sets it apart from more mundane vehicular thoroughfares, and its tradition of uniquely sensitive engineering and design continues, because an extension of the Blue Ridge Parkway into Virginia’s Explore Park including a 600-foot curvilinear bridge is about to be

built next year with the same attention to detail as was originally the case.

And while the original or primary motivating force behind the Appalachian Trail and the Blue Ridge Parkway may have been to get human beings from one place to another, either on foot in by automobile, in as aesthetically pleasing and environmentally sensitive a way as possible, another motive recently has surfaced to help argue for linear parks. That motive was summarized by Patrick F. Noonan, President of The Conservation Fund, in his Forward to Charles E. Little's book, *Greenways for America*:

"Urbanization has fragmented our open country, severely jeopardizing the natural corridor systems that protect water supplies, maintain biological diversity, and preserve natural beauty. And new research revealed that recreational activities such as bicycling, jogging, and walking are among the most popular uses of leisure time. These findings clearly suggest a crucial role for greenways in environmental planning and action."⁸

Even more recently, wildlife biologists have joined the campaign for linear parks, to save imperiled wild animals whose home ranges are being cut up into tiny pieces by logging, road-construction and other human development. Both so-called "sensitive species" requiring large tracts of undisturbed habitat and large keystone predators which range long distances are particularly affected by habitat fragmentation.

A statement of my own six years ago—"Overview from Defenders' President," leading off a 1989 report published by Defenders of Wildlife entitled *In Defense of Wildlife: Preserving Communities and Corridors*—included this observation:

"There does seem to be something

new under the sun, so far as practical means of conserving biological diversity are concerned. That approach—the conscious preservation of migration corridors or land bridges between fragmented centers of plant and animal richness—is what this book is intended to describe and advocate."⁹

Since then the requirement to identify and protect wildlife travel corridors in National Forest Land Use Plans and other wildland planning documents has pretty much become a standard operating procedure ... and the failure to provide for wildlife travel corridor protection has become a basis for wildlife conservationists to appeal or litigate for a revision and improvement of national forest plans.

So linearity in park design serves well both man and beast. Our current problem, then, is not so much the issue of whether linear parks are *per se* good things, but whether we can defend them in the political process from a new generation of skeptics who want every enterprise, public or private, to stand on its own financially—to pay for itself or prepare to be abandoned.

Back in 1951 Freeman Tilden, in his classic textbook, *The National Parks*, tried to establish why parks are different from commercial businesses: "In the national parks there is no harvesting of timber. There is at present no hunting of wild animals. There is no mining of minerals. There is, or should be, no grazing of domestic animals. There are no shows, or what are commonly known as "amusements." There is no attempt to make profits. The parks are operated on funds appropriated by Congress, and the receipts from visitors go into the miscellaneous receipts of the Federal Treasury, so that the balancing of income and outgo, common to business enterprises,

does not exist. This scheme of land use, so far removed from the average person's economic experience, may glancingly seem strange and remote. And so it is. It is a new theory in the world, of management of the public land for a superior kind of pleasure and profit; for the perpetuation of the country's natural and historic heritage, untarnished by invasion and depletion other than that of invincible time. No wonder, then, that it is a difficult story to tell."¹⁰

While the data from a new analysis of the regional economic impact of parks would be helpful, I've concluded that the only people who can tell that story convincingly are the parks' own users ... and the only defenders the parks can count on are the interest groups organized in defense of the parks such as the National Parks and Conservation Association, the Appalachian Trail clubs, the Sierra Club, The Wilderness Society and others, particularly the regional and local groups who know the parks in their own backyards intimately, have acquired a "sweat equity" in their park or parks, and will fight for their parks' survival and well-being.

The essential nature of supportive public involvement in park management and park defense was well summarized by William E. Brown in a 1971 National Recreation and Park Association book entitled *Islands of Hope: Parks and Recreation in Environmental Crisis*:

"It cannot be escaped that environmental management to perpetuate the Nation's park and recreation lands provides the action crucible for public involvement in the larger across-the-land environmental reform movement. Only if the public sees the Nation's park and recreation lands as the first line of defense against *general* environmental

decay; gets involved at the action level to save them; and begins to see the local, regional, and national implications in such saving-only then will environmental communications begin to mean something. The statement that park- and recreation lands are the first line of defense against general environmental decay deserves analysis: It is because environmental quality is so finely balanced that quality environments are so vulnerable. It is just because the struggle for life in degraded urban environments is so hard that park and recreation areas tend toward expendability."¹¹

How important are well-organized local constituencies such as Friends of the Blue Ridge Parkway and the Coalition for the Blue Ridge Parkway to the future of the Blue Ridge Parkway, other parks and park systems in general? The answer is well summarized in a 1990 report published by the Eastern National Park and Monument Association entitled *National Park Service: The First 75 Years—Preserving Our Past for the Future*. In its concluding section, on Partners and Alliances, are these words:

"Somewhere in the history of nearly every park is a dedicated group or individual who cared enough about that place to do whatever was necessary to save it, improve it, and share its significance with others."¹²

If I were to be asked to list a few things I've done in my life that I'd like to be remembered for, they certainly would include my efforts to strengthen our Nation's park and wilderness systems, such as serving as a lead lobbyist for the passage of the Wild Rivers Act and working in many capacities to expand and strengthen the National Wilderness Preservation System. Life is short and in my view there is no better

way to spend it than by devoting much it to the defense of nature—to the conservation of the beautiful natural environment we've inherited from our parents and have borrowed from our children.

That's what parks are: vignettes or examples of wild nature and of our cultural history. And linear parks serve a special purpose: To provide connections between undeveloped islands of green,

to help assure the ecological integrity of the landscape in which we live.

Protecting them is our task. Let's get about it with renewed enthusiasm! Thank you.

M. Rupert Cutler, Ph.D., Executive Director, Virginia's Explore Park, Roanoke and Adjunct Professor of Wildlife Sciences, Virginia Tech

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²Aldo Leopold, *ASand County,Almanac and SketchesHere and There*. New York: Oxford University Press, 1949, p. 174,

³Nathaniel Alexander Owings, *The American Aesthetic*. New York: Harper & Row, 1969, p. 144.

⁴Ian L. McHarg, *Design With Nature*. Garden City, NY: The Natural History Press, 1969, p.5.

⁵Edward Abbey, *The Monkey Wrench Gang*. New York: Avon Books, 1976, p. 28.

⁶Eugenia H. Connally, ed., *National Parks in Crisis*. Washington, DC: National Parks & Conservation Association, 1982, p. 1.

⁷*Appalachian Trailway News*, November/December 1985, cover.

⁸Charles E. Little, *Greenwaysfor America*. Baltimore: The Johns Hopkins University Press, 1990, p. xii.

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¹⁰Freeman Tilden, *The National Parks*. New York: Alfred A. Knopf, 1968, p. 18.

¹¹William E. Brown, *Islands ofhope*. Washington, DC: National Recreation and Park Association, 1971, p. 49.

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The Spring Creek Corridor: A Conceptual linear Open Space Plan for an Emerging Metropolitan Region

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INTRODUCTION

Spring Creek runs through the Nittany Valley, one of the great carbonate valleys in the Ridge and Valley Region of the Appalachian mountains of central Pennsylvania. Numerous springs arise from the aquifer deep in the caves and crevices of the limestone underlying the valley, feeding the stream with a constant supply of cold, high pH water. The linear six to eight milewide valley is defined by sandstone ridges that rise 1000 feet above the valley floor (see figure 1). Spring Creek's headwaters origi-

nate in small streams that tumble through hemlock and rhododendron-filled gaps in Tussey Ridge to the south of the valley and exit through a gap cut in Bald Eagle Ridge to the north, the water making its way to the Atlantic Ocean by way of Bald Eagle Creek, the Susquehanna River, and the Chesapeake Bay.

The stream and springs that feed it create a diverse set of habitats for many species of plants and animals as the stream traverses a variety of geologic and topographic settings across the valley. The aquatic habitats of Spring Creek are exceptional quality, nurturing one of the most productive wild trout fisheries in the eastern United States.

People have long valued the creek. The archeological remains of prehistory line the stream-side where Indians found

the flood plain, trout and pure water conducive sites for villages. Likewise the first European settlers to establish permanent settlements on this portion of the frontier in the 1790's, found the creek a valuable asset. They found that the limestone-derived soils were excellent for agriculture and that in places they contained deposits of iron ore. It was not long before the native valley forest was cleared, it's trees processed into charcoal, and the once forested landscape rapidly changed to one of farms and scattered iron ore pits. Because this



Figure 1. The Spring Creek watershed in the Nittany Valley of Central Pennsylvania. The study corridor is outlined along Spring Creek and the tributaries of Cedar Run, Slab Cabin Run, Roaring Run, and Big Hollow.

karst valley is internally drained through its underlying limestone bedrock, Spring Creek and its few tributaries run through the landscape, with large expanses of upland between them. The pure water from these spring-lined streams and their potential to support the late eighteenth and early nineteenth century

water power dominated frontier technology, made the banks of Spring Creek the focus of village settlement, commerce, and industry, while the upland was valued for agriculture. At many places along Spring Creek dams and mill races were constructed to power grist mills, saw mills, forges, and other machinery. Small villages grew at these locations, their stores, post office, and churches serving the surrounding countryside. The largest of these nineteenth century

towns along the creek is Bellefonte, the county seat of Centre County. Until shortly after the turn of the twentieth century, Bellefonte was a prosperous center of rural commerce, industry, and politics, five of its residents becoming Pennsylvania Governors.

Throughout the twentieth century, many changes have taken place in the region. The small industries that once lined the creek disappeared and the once-prosperous Bellefonte has stagnated. The Pennsylvania State University and the town of State College, which lie just a few miles west of the creek, has grown from a small agricultural college to the central focus of a growing metropolitan region. This metropolitan region, now an economic force of its own, supports a growing number of high-tech and information based industries, and is experiencing the same kind of decentralized urban growth that is occurring in many locations situated within easy access to the intersection of major highways.¹

Urban growth is rapidly encroaching on the Spring Creek corridor. As this occurs, two things will happen that

will affect the lives of the future residents of this expanding metropolitan region. First, the cultural and ecological values inherent in the stream corridor will be diminished. Second the opportunities for public recreational open space that the corridor now holds for the future population will disappear as the land within that corridor is developed.

In 1993 the ClearWater Conservancy, a local conservation organization, recognized that the creek and adjoining land has the potential to enhance the lives of the community's residents through ecological conservation, historic preservation, outdoor recreation, education, and the establishment of publicly accessible open space. The Conservancy sought the assistance of the authors to study this potential within the Spring Creek corridor. The intent of the project was to study the entire corridor of Spring Creek and five of its tributaries to make recommendations that would guide the Conservancy in their role as advocates for policy change and to inform their efforts in developing a planned program of easements, acquisitions, and cooperative arrangements with local landowners and local governments. The Conservancy would also use the study as a means of informing the public about the potential of Spring Creek, increasing community awareness of the creek and its resources, and ultimately engaging the people of the region in its conservation. In addition the conservancy would promote the recommendations of the study as a community vision—a set of ideas intended to spark enthusiasm within the community for the role that this corridor could play in the community's future. The two year study was funded by the ClearWater Conservancy, the National Fish and Wildlife Foundation, the Pennsylvania Department of Environmental Re-



Figure 2. Example of the ecology inventory — map of plant communities and cover types in the Fisherman's Paradise section of the study corridor.

sources, the Borough of Bellefonte, the Pennsylvania Fish and Boat Commission, and the Centre Regional Planning Commission. The study was conducted by the authors.

ISSUES

A region-wide analysis of urban growth reveals the rapid development of the valley's agricultural uplands. Within this changing landscape, the Spring Creek corridor contains natural, cultural, and open space attributes that could contribute significantly to the quality of life in the rapidly growing metropolitan region of which it is a part. The stream corridor has the potential to provide the emerging community with outdoor recreation and education in a connected system of open space enhanced with ecological, historic and scenic landscape values. However, like most places experiencing rapid growth, this region is caught in a familiar dilemma. Public awareness of the form that the emerging community will take and exactly what attributes of the landscape would most contribute to that community's quality of life, lags severely behind the professional planners' ability to protect those attributes from a level of degradation that would render them unusable as a multi-value system of connected open space. The natural, cultural, open space, and scenic attributes of the corridor have been diminished and are further threatened by impending urban growth.

The Need for Water Quality Protection

Spring Creek is rated among the top five most productive trout streams in the eastern United States. Trout and other aquatic life of Spring Creek depend directly upon the quality of the creek's water, which is threatened by the effects of urban growth. The discharge of waste

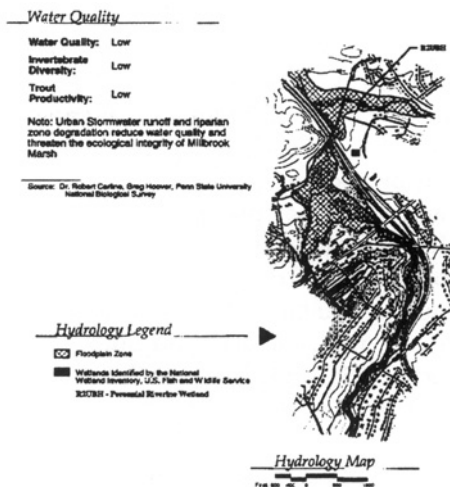


Figure 3. Example of the hydrology and water quality inventory — the Slab Cabin North section of the study corridor.

water from sewage treatment plants into the creek is an inevitable consequence of this growth. In order to maintain the trout habitat, the effluent must be pure but it must also not warm the creek significantly. Along with urban growth comes a great increase in the amount of impervious surface across the landscape. Unless managed properly, the rain that will fall on roofs, roads, streets, sidewalks, and parking lots will run off to be discharged into the creek via drains and storm sewers. This runoff will carry a significant amount of non-point source pollution in the form of sediments and other compounds washed from roads and parking areas, and fertilizers and pesticides from lawns, gardens, and golf courses. Increased runoff and storm water will also disturb the natural hydrology of the creek causing higher peak flows and more destructive floods, and decrease the recharge of ground water aquifers which would otherwise nourish the stream during periods of low flow.

The condition of Spring Creek's riparian zone—it's stream banks and flood plains—is of primary importance to the quality of the water and aquatic habitats of the stream. Stream banks without

The Need for Conservation of Historic Resources

Early settlers found the potential for waterpower and the pure springs along Spring Creek to be particularly conducive to the establishment of towns, villages, and industries. Many small waterpower-based industries flourished throughout the corridor in the nineteenth century. Prior to 1850 the iron furnaces of three counties in central Pennsylvania (of which those along Spring Creek were a part) collectively produced half of America's iron. By 1900 however, little was left of this rural iron industry and by the 1930's the last of the grist mills were closed. Since then, some of the smaller villages have almost disappeared, but those that contained enough urban fabric to survive the loss of their economic base remain as a reminder of a past era.

While these industries and the towns that grew up around them are a valuable part of the past, agriculture provides the dominant image of the character of the Nittany Valley landscape. Along parts of the corridor, farms that have remained viable for nearly two hundred years line the stream, their fields, hedgerows, woodlots, and nineteenth century farmhouses and barns reflecting the historic character of the region.

These visible remnants of the past are valuable to both present and future residents of the region.² The tangible past in the landscape contributes to a sense of place and gives both residents and visitors a way to experience history other than seeing it in a book or a museum. Urban growth threatens the integrity of the cultural past in the landscape in a way that is similar to the way that urban growth threatens to fragment plant and animal habitats in the natural environment. The pattern of artifacts of the past in the landscape are often



Figure 6. Example of the zoning inventory — the Boalsburg section of the study corridor

thought of as fabric. The fabric may be worn, but the woven-in pattern may be interpreted and understood as long as a sufficient number of the threads are in place. As artifacts of the past are lost to urban growth however, the fabric of the historic cultural landscape is fragmented and gradually made less discernible. These incremental changes occur in many ways. Winding country roads are straightened and widened; new buildings are built around and between the old; and artifacts like stone walls, hedgerows, and landforms are easily erased from the landscape. As farms are converted to residential subdivisions, the few remaining farmhouses or barns are insufficient to retain the character of the agricultural past. The end result of this fragmentation would be a total loss of historic fabric so that eventually only a small number of isolated artifacts would remain as vague reminders of the past.

The Need for Enhancement of Community Open Space and Scenic Visual Resources

Another related and equally important aspect of the corridor is threatened by the incremental encroachment of ur-

ban growth-the recreational and scenic value of the corridor as open space for the larger community. The Spring Creek corridor landscape, areas both in public and private ownership, has long been valued for its open space, recreational opportunities, and scenic beauty. Several parks face the creek, it is canoed during high water, and it is a great attraction to fly fisherman who pursue the wild trout that thrive in its cold spring-fed water. But the corridor's greatest value as recreational open space will not be fully recognized publicly until urban expansion has further developed the valley's farmland and the population density has increased. Only then will the need for open space be fully felt. The corridor has the potential to serve as a central spine of connected open space, but the potential continuity of this corridor has, in many places, been severely fragmented. As growth continues, the extent to which the corridor will continue to be available as public open space remains in question.

STUDY PROCESS

The process employed to carry out this study can be examined in five component parts. The first is the development of a computer-based system of managing, manipulating, and providing graphic output for the large amount of information generated by the study. The first second component is building a comprehensive landscape understanding through an inventory and analysis of the natural and cultural resources of the stream corridor. Third is an evaluation of those resources to assess their relative value, condition, and potential as elements of an open space system with ecological, historical, and scenic attributes. The fourth part consists of a set of conceptual recommendations that suggest particular actions that might be

taken throughout the corridor to enhance those ecological, historical, scenic, and open space attributes. The fifth is a program of public education intended to communicate the study results.

A Computer-Based System of Information Management

Integral to the completion of all phases of the study is the use of digital media to collect, process, communicate, and store information about the corridor. An integrated approach using a wide range of hardware and software was chosen in order to achieve several important goals. The first is to provide a flexible system that would allow the study team and the Conservancy to integrate and manage the large amount of information collected and produced for the study. This system must allow non-expert computer users to easily access, update, and archive information. To achieve this goal a 2D/3D computer aided drawing program, MiniCAD 5.0 was selected to complete the mapping component of the project. Although MiniCAD is not a Geographic Information System (GIS), it does provide powerful tools for information management including layering, object naming, groups and classes, and full database and spreadsheet integration. It also allows raster-based digital photographs to be fully integrated with the vector-based mapping elements.

The second goal was to provide a system that would provide the most extensive options for manipulating the information once it is in digital form. MiniCAD provides many ways to manipulate the display of information through various combinations of graphic scale, graphic style and layer combinations. These combinations can be programmed as macros that can be

executed instantly to set up various combinations of information.

The third goal in the use of computer technology was to allow maximum flexibility in the communication of the study information. The use of digital media provided a number of options that were used throughout the study process and at its conclusion. Printed output in color and black and white, at several different scales and sizes, was used in field verification and data collection, distributing information for review, and citizen participation at public meetings. By combining the maps, text, photographs, sketches, and other graphics in a page layout program, the study team assembled an 11x17 inch bound report summarizing the results of the study. Finally, multimedia presentations, projected from a computer on a large screen using an overhead projector and a color LCD projection panel, were developed to deliver customized presentations to a wide range of audiences. These presentations added the dimensions of full motion video and sound to the other types of information (maps, photos, text, etc.) that were used to complete the study.

Corridor Inventory of Natural and Cultural Resources

The geographic area of study covers the main stem of Spring Creek and five of its tributaries: Cedar Run, Slab Cabin Run, Roaring Run, Thompson Run, and Big Hollow (a dry hollow that lies above an underground tributary of the aquifer that feeds Spring Creek). In all, the corridor under study is approximately 35 miles in length and on average, 2000 feet wide (1000 feet on either side of the stream), creating a total study area of approximately 13 square miles (see figure 1).

To begin the process, a low level

aerial photographic survey of the corridor was completed providing both a detailed photographic record of the corridor and accurate topographic and planimetric data. The data was digitally converted into CAD maps at a five foot contour interval. To facilitate the study, the corridor was divided into fourteen landscape sections, each section having its own computer map. Paper maps were printed for recording field data which was transferred to individual overlying layers in the computer map.

Developing a thorough understanding of this particular landscape would require a four-part inventory: ecology and surface hydrology, cultural history, land use and zoning, and property delineation and ownership. All publicly accessible lands in the corridor were field surveyed several times by members of the study team. Additional data was collected from local and state agencies, governmental authorities, previous scientific studies, historical surveys, and historical maps and other records. The results of the inventory were compiled in a set of four maps (ecology and surface hydrology, cultural history, land use and zoning, and property and ownership) for each of the fourteen sections of the corridor. Examples of these inventories are contained in figures 2, 3, 4, 5, 6, and 7.

Ecology and Surface Hydrology—The ecological inventory was begun by examining aerial photographs, noting and recording on field maps the discernible boundaries between vegetation types. These maps were then taken into the field where the vegetative cover was classified into various subcategories under a broader categorization of plant community associations. Figure 2 illustrates the inventory of plant communities and cover types in the diverse *Fisherman's Paradise* section of the corridor.

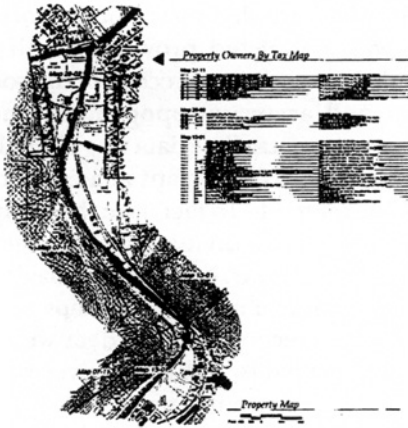


Figure 7. Example of the property ownership inventory -- the Milesburg section of the study corridor.

The flood plain was delineated on each section map along with the wetlands identified by the National Wetlands Inventory. The results of previous scientific studies of water quality, invertebrate density and trout productivity were recorded, and The Natural Heritage Inventory of Centre County provided detailed data on rare, threatened, and endangered species and natural communities. Figure 3 shows the hydrology and water quality map of the *Slab Cabin North* section of the corridor.

Cultural History—The first step in the inventory of the observable remains of the past human use and settlement of the corridor landscape included a simultaneous review of historical maps, a review of the written record of local history, consultation with local historians, and a preliminary field survey. The historical maps, one of the most valuable resources in relating historic themes to the landscape, included an 1873 county atlas, Sanborn Fire Insurance Maps, and a succession of U.S. Geological Survey maps. Archeological data and the results of a previous architectural survey were obtained from the Pennsylvania History and Museum Commission. Data from this research was recorded onto

maps and carried into the field as background to inform field observation. All visible artifacts of the past, in use or abandoned, were recorded on the computer maps, along with archeological sites. Figure 4 is a portion of the cultural history inventory of the *Belle nte* corridor section.

Land use and zoning—The corridor land is contained within parts of three boroughs and nine townships, each with its own zoning and land use designations. For purposes of the study these disparate designations were reclassified into a single nomenclature allowing the corridor to be evaluated as a single unit. Figure 5 is a portion of the land use inventory of the *Lemont* section, and Figure 6 is the zoning map of the *Boalsburg* section.

Property delineation and ownership—Given the tremendous variety of land ownership, both public and private, within the corridor, and the ClearWater Conservancy's interest in easements and cooperative agreements with landowners, an accurate record of property lines and land ownership was developed for the entire corridor. While these records were readily available from the county tax office, they were not available on topographic maps. Property lines and ownership were transferred to the computer maps using the aerial photographs and field observation. Figure 7 is a portion of the *Milesburg* section property ownership map.

Corridor Assessment

The necessary step between the inventory of existing conditions and specifying recommendations for the corridor landscape is an assessment of that inventory evaluating its particular attributes relative to the issues outlined above. Each of the corridor's fourteen sections was assessed and that assessment was

summarized on a separate map for each of the sections. The following questions summarize the assessment carried on throughout the study corridor.

Ecology and Surface Hydrology

- Where are outstanding native plant communities and species of special concern, and where are they threatened?
- Where are areas of high quality aquatic habitat and where are they threatened?
- Where are locations of other outstanding natural resources, such as the visible expressions of geology?
- Where are important aquifer recharge zones that need protection from point and non-point pollution sources?
- Where is the riparian zone degraded and in need of restoration on both public and private land?
- Where is stormwater runoff, sedimentation, and non-point source pollution degrading stream quality?
- Where are opportunities for future ecological restoration within the stream corridor?

Cultural History

- Where are specific historic artifacts or features that represent interpretable themes in the community's past?
- Where are zones of outstanding historic interest?
- Where does historic landscape fabric exist and where is it threatened?
- Where are historic places lacking National Register designation where there is potential?
- Where are existing National Register Historic District boundaries inadequate for recognition and protection of historic resources?

Recreational Open Space Potential

- What lands within the corridor have public ownership and are accessible?
- What lands within the corridor have public ownership but public access is currently restricted?
- Where is pedestrian access available within the corridor?
- Where is recreational access blocked throughout the corridor?
- Where are pedestrian and bicyclists presently using the corridor for recreation?
- What roads through the corridor are unsafe for pedestrian or bicycle recreational access?
- Where does private ownership of stream frontage block public access to the creek?
- Where are connections to adjacent public parks and where are connections lacking?
- Where are opportunities for the corridor to serve as a regional open space connector?
- What areas within the corridor are most likely to undergo residential development in the near future and where is this land use change likely to create demand for recreational access to the creek?

Visual and Scenic Character

- Where are zones of outstanding scenic character?
- Where are scenic views throughout the corridor and where are they unprotected from degradation?
- Where are opportunities for scenic and visual improvement to highways that cross the corridor?
- Where do natural and historic features provide scenic landmarks within the corridor?

Recommendations

The study recommendations are intentionally broad and conceptual, designed to inform the Conservancy and the community of ways that the problems and opportunities outlined in the corridor assessment could be addressed through specific actions. A map was developed for each of the fourteen corridor sections to graphically and verbally present the conceptual recommendations. While the recommendations in many places are particular to specific situations, the following represent the general categories of those recommendations.

Riparian Conservation Zones-ensure protection of existing wetlands and restore streambank vegetation on public lands and establish special riparian zone management program for private landowners to assist in streambank revegetation and stream buffer maintenance without public access requirements.

Urban Stormwater Management-control of runoff and non-point source pollution should be established at existing urban areas.

Revegetate Streambanks-eroded streambanks should be revegetated to stop erosion and restore riparian habitats. Canopy trees should be planted to shade the stream, minimizing warming during hot weather.

Aquifer Recharge Protection Zones-recharge areas and well fields should have stormwater protection and land use controls to protect groundwater quality.

Natural Resource Protection Areas-areas containing outstanding natural resources should be established to protect rare species and natural communities.

Spring Creek Canyon Nature Reserve-establish a nature reserve on the extensive

expanse of public land within the Spring Creek canyon. The outstanding natural and scenic resources should be protected and public access improved.

Historic Resource Protection Areas-currently unprotected historic resources within the corridor should be protected and public historic interpretation should be improved.

National Register Historic Districts-several places within the corridor are eligible and nomination should be pursued.

Enhance Public Access-establish recreational path connections on public lands where those connections do not currently exist. Establish recreational access with streetscape enhancement in urban portions of the corridor.

Waterfront Parks-in the town of Bellefonte, establish waterfront parks on existing public lands that would enhance access to Spring Creek and recreational opportunities.

Scenic Resource Protection Areas-establishment of effective land use controls that preserve scenic resources such as forest cover on mountain sides facing the corridor.

Gateways-at particular points throughout the corridor gateways should be established to call attention to particular recreational or management zones or to announce arrival into urban areas. For example, streetscape gateways are proposed for the town of Bellefonte, a gateway is proposed for the entrance into the Spring Creek canyon nature reserve, and one for the place where the corridor enters the State Forest at the creek's headwaters.

Scenic Urban Greenway-within the Big Hollow portion of the corridor a large expanse of publicly owned land exists between the Pennsylvania State University and residential neighborhoods that could establish a recreational con-

nection between the urbanized core of the region and the main stem of Spring Creek.

Recreational Access and Stormwater Management for New Development—new residential development within the corridor should provide for recreational access to Spring Creek, establish riparian conservation zones, connect open space and natural habitats along the stream, and manage stormwater to minimize runoff, increase infiltration, and reduce pollution.

Public Education

Integral to fulfilling the basic intent of the project is communicating the study results and recommendations to the public. This was accomplished both as a series of public computer-based multimedia presentations made by the authors throughout the course of the study and as a set of printed products to assist the ClearWater Conservancy in their ongoing efforts to communicate the results of the study.

The multimedia presentations, combining text, maps, photographs, sketches, sound, video and a live speaker were developed early in the study to introduce a variety of audiences to the intent of the study. Throughout the study, the presentations were adapted to reflect the study's progress. At the study's completion, a final multimedia presentation was developed to summarize the results.

The printed products were intended as a complete record of the study inventory, assessment, and recommendations for the fourteen corridor sections. In addition to serving the Conservancy as a record, the products were designed to support a variety of presentational roles. The 11x17 inch bound color report summarizes the study and provides an over-

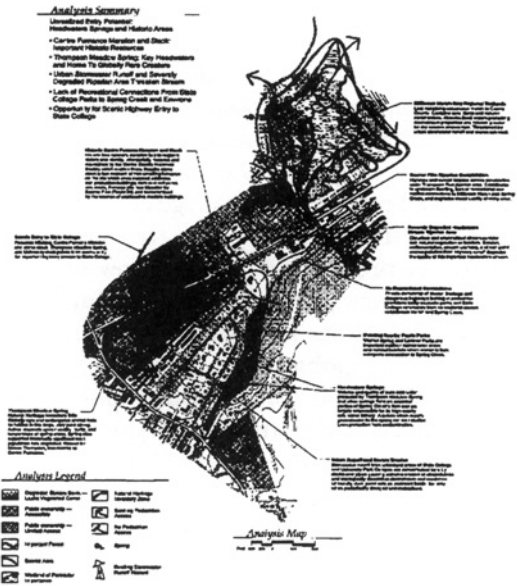


Figure 8. An example of the corridor assessment — the Thompson Run section of the study corridor.

view of the recommendations. The report was distributed to various municipal authorities, civic groups, and business leaders as an educational and fund raising tool. The five maps of each of the corridor sections that contain the inventory, assessment, and recommendations were printed at different sizes for use in different situations. The 11x17 inch maps can be hand held or bound into the report, at 18x24 inches they can be used for table top discussions or small-group presentations, and at 36x48 inches they can be used for large-group presentation and displays.

EXAMPLE OF CORRIDOR ASSESSMENT AND RECOMMENDATIONS

The Thompson Run section provides an example of the corridor assessment (see figure 8). Thompson Run, is the shortest of Spring Creek's tributaries, yet it lies at a key location in this changing region. Even though it is perhaps the most urban of the fourteen sections, it contains important opportunities for

enhancing water quality, the integrity of natural habitats, the expression of local history, and open space connections.

Thompson Run arises from Thompson Meadow Spring which is located less than 1000 feet from the most densely urbanized core of State College and even closer to the town's sewage treatment plant, yet produces a copious flow of cold and very pure water welling up from the aquifer. This isolated habitat is home to a globally rare and endangered animal and a small trout population. Survival of both of these species depends on the continued flow and purity of the spring. Stormwater runoff from the adjacent existing urban development has eroded the streambanks downstream of the spring, and threatens it with ecologically damaging sedimentation. As these pure spring waters flow toward their confluence with Spring Creek, the stream is disturbed and channelized and further threatened by non-point source pollution from the runoff from the adjacent highway and businesses. As Thompson Run approaches Spring Creek, it flows into Millbrook Marsh, the last remaining calcareous marsh remaining in the valley, which contains rare plants and habitats. This marsh absorbs stormwater, protecting downstream properties from flooding and releases water slowly to maintain dry weather stream flow. The marsh is threatened by runoff and sedimentation from possible urban encroachment at its margins.

Thompson Run was named for Moses Thompson one of the iron masters at Centre Furnace, a charcoal-fueled iron furnace that operated between 1791 and 1858. The limestone furnace stack and the restored Iron master's house, now home of the Centre County Historical Society, lie along the four-lane route 26 across from the spring which once

supplied waterpower to the furnace by way of a millpond and race. Behind Centre Furnace is agricultural land owned by the Pennsylvania State University.

Pedestrian access within this area is limited. The furnace and the university are historically linked (through the sale



Figure 9. An example of the corridor recommendations — the Thompson Run section of the study corridor.

of furnace land to the State in 1855, to establish the university) yet no pedestrian access exists between these two adjacent properties. The highway is not conducive to pedestrian access and even though two new parks bring pedestrians close to Thompson Run, they fall short of making a connection between the town and the stream. Ecological, historical, scenic, and open space values exist within this small area, yet none are linked to one another, to the town, or to the campus.

To illustrate the corridor recommendations, the *Thompson Run* section again provides a good example (see fig-

ure 9). The assessment revealed landscape elements having significant ecological, historical, scenic, and open space values within close proximity to one another, yet having no pedestrian connection to one another, to the town, or to the campus. Recommendations for this section of the corridor suggest enhancements to these values while enabling pedestrian connections and access to the stream. The central component of these recommendations is the establishment of a gateway park to reunite the historically linked Thompson Meadow Spring with Centre Fumace—now separated by the highway. This section of the highway, instead of being a divider, would become the center of the new park. The highway would be redesigned as a tree-lined boulevard with pedestrian access and accommodation for safe pedestrian crossing (see figure 10). The park would establish pedestrian access through the existing adjacent parks, through university-owned land, and establish pedestrian links down-stream to Millbrook Marsh. The stream itself would be protected by restoring the streambanks and revegetating the riparian zone. Wetlands and sedimentation basins would be constructed to protect the spring from existing stormwater runoff. Millbrook Marsh would be protected through easements or acquisition and designated as a nature reserve with controlled public access and environmental education opportunities.

DISCUSSION

The ultimate impact of the Spring Creek corridor study will not be known for many years. Which of the recommendations will find adequate community support to achieve full implementation? How many opportunities for open space connections within the corridor

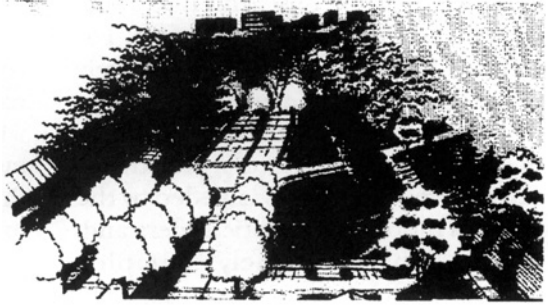


Figure 10. Sketch of proposed Gateway Park.

will be lost to development before community awareness and support is built? Will the corridor ever become a connected system of linear public open space or will its components remain isolated? Will Spring Creek remain as a high-quality cold-water wild trout habitat, or will it become a warm and sediment choked conduit for stormwater? Will the corridor fulfill its potential as a community focus for history and nature interpretation? The answers are unknown, but much of the future success of the corridor study lies in the extent to which the ClearWater Conservancy and the regional planners are able to promote a vision for Spring Creek, and the extent to which that vision meets the community's needs and demands for public open space.

This study was intended as the first phase of a proposed series of planning studies for the Spring Creek corridor that may or may not be undertaken depending upon the success derived from this first phase. While the authors believe that the methods employed in this study were appropriate to the intent and available resources of this phase, they also believe that future study methods should be designed to reflect the scope and resources of those future phases as well as lessons learned from the first phase.

A self evaluation of the first phase

of the study point to several issues that could be addressed by future phases. For example, future study should actively seek organized public input in the form of surveys, questionnaires, or public meetings. Accurate planning relative to subsurface hydrology is impeded by the lack of a thorough scientific understanding of the extremely complex hydrogeology. Answers are greatly unknown to such crucial questions as the specific locations of aquifer recharge, the flow pattern of the aquifers, and from where individual springs receive their flow. The current study's level of understanding of the visual and scenic characteristics of the corridor lacks specific delineation of valued viewsheds that could be further developed with the aid of computer analysis. Assessment of the corridor was based largely upon the authors' expertise and familiarity with the conditions of the corridor landscape. Future study might benefit from greater input from outside experts in other fields. While utilizing GIS was not seen as appropriate to the needs of the first phase, future study using the analytical capability of GIS would enable the study team to make more precise assessments.

The intent of the study recommendations was to present a vision of design possibilities and stimulate community

discussion. The study recommendations were aimed at this intent, but could be considered naive relative to the complex nature of the changing landscape in which those recommendations are made. As a conceptual vision, each of the recommendations has the potential to achieve its ecological, historical, recreational and scenic potential, but there are several next steps to be undertaken before these conceptual recommendations can be implemented.

The public education component of the study has succeeded in presenting the study's vision to planners, elected officials, and business and community leaders, but no linear open space system proposed for a rapidly growing region can succeed without overwhelming community support. Future phases of the study should both seek broad community input and extend the outreach of public education further into the community.

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¹ The pattern of rapid decentralized urban growth has been explored by Joel Garreau in his book *Edge City*, and by Peirce Lewis in his paper *The Galactic Metropolis*.

² The value of the past to the present residents of a landscape has been written about extensively by such scholars as Peirce Lewis and David Lowenthal.

Establishing a Link Between Interpreting the Evolution of a Landscape and Landscape Management Practices

by Terry L. Clements, ASLA, Virginia Tech, Blacksburg, VA

INTRODUCTION

The landscapes around us are a record, or an autobiography, of our past. The land forms and available resources influenced our movements, settlement patterns, business ventures and our leisure activities. Today's surface features reflect our past and current values, pre-occupations, aspirations and fears. Grady Clay said that, "there are no secrets in the landscape." All of our cultural warts and blemishes are there and our glories too; but above all, our ordinary day-to-day qualities are exhibited for anybody who wants to find them. (Lewis, 1979) However, they are not always readily apparent and often require some interpretation. Few people consciously realize that even our scenic and "wilder" areas have been, and continue to be, modified and managed by human activities.

The Mount Rogers Scenic Byway, located in the Mount Rogers National Recreation Area of the Jefferson National Forest in southwestern Virginia, provided an opportunity to develop an interpretive plan that would encourage visitors and local residents to view the surrounding landscape as a record of on-going natural occurrences and human activities. If people are to develop an understanding and deeper affinity with their surrounding environments, it is vitally important that each begin to see that the landscapes around them are continually modified by such natural occurrences as geologic movements, erosion, and flooding. More importantly, these landscapes have been and are continuing to be, modified by numerous human activities. Such activities as timber harvesting, farming,

road and rail building and settlement have influenced the evolutionary course of the region and they will continue to induce change. Hopefully, by initiating an interpretive program that emphasizes the forces of landscape change and evolution as evidenced along this byway, visitors will begin to grasp the magnitude that individual and collective human activities have in this process.

THE MOUNT ROGERS SCENIC BYWAY: A CASE STUDY

The Mount Rogers Scenic Byway is a component of the National Forest Scenic Byway System. It provides access to unique opportunities for travelers to discover the cultural, historical, biological and geological resources of a representative Appalachian landscape. While the byway was officially designated in 1988, by 1993 the USDA Forest Service had yet to develop an interpretive program to guide development of interpretive programs and other facilities within this corridor. However, the byway's visual corridor is a dynamic landscape and the region's visual character was continuing to evolve. Clear cut forests were regenerating. Agricultural fields were falling into disuse and hedgerows were disappearing. Vacation homeowners, other non-farmers and new farmers were settling on private lands along the corridor. As economic conditions shifted along the corridor, so did land uses. Also, the USDA Forest Service's mission has evolved from a predominate focus on extracting forest resources and toward a less extractive, conservation-based recreation and tourism land use. If a program interpreting

this landscape in transition is to be coherent, landscape management policies and practices have to be developed that support the program goals. Careful inventory and analysis of past, present and potential land uses and their associated visual landscape patterns provided a basis for developing an interpretive plan that links to landscape management practices.

The scenic byway's visual and cultural corridor was identified through analysis of visual resource assessment mappings. This analysis revealed land form, landscape, and vegetation patterns unique to the region and quite different from those of other national landscape regions. For instance, the mid-ground landscapes are fairly close to the viewer. Mid-ground landscape patterns such as the "forest glade" are characteristic of this region of Appalachia. Also, although much of the visual corridor is narrowly defined, there are significant long views to the shoulder of Mount Rogers, down side valleys and through Whitetop Laurel Gorge. Due to the predominate deciduous vegetation, visual dominance of foreground, mid-ground and background views varies with each growing and dormant season.

When the visual assessment mappings were compiled with research on the region's cultural and natural history, explanations for these patterns were discovered and the continually evolving landscape patterns revealed significant traces of historic natural occurrences and patterns of human settlement and landscape exploitation.

INTERPRETIVE STORY SETS

Within the boundaries of the scenic byway's visual corridor, there are numerous traces of the region's past natural and cultural identities. The corridor consists of two major landscape types. The western end is dominated by the Whitetop Laurel Gorge. This section of the byway

is intimately connected to the creek's run down the gorge as the roadbed runs parallel to and over the creek. Much of the remainder of the corridor is a valley landscape, closely hemmed in by parallel mountain ridges. The evolving landscape or "landscape in transition" provided the focus needed to develop a coherent and informative interpretive theme for the scenic byway corridor. The interpretive theme: *Landscapes in Transition, Past, Present and Future*, was selected as an appropriate means to present the landscape changes, or evolution, as influenced by natural events and human activities. While the goals of the interpretive theme reflect those of the Jefferson National Forest, they emphasize: (1) creation of a sense of connection between the byway visitor and the Appalachian landscape and (2) provision for visitors to develop an understanding of how and why this landscape has changed and will continue to change.

Specific interpretive story lines were outlined to:

- trace the forces and events that created the landforms, and wildlife and vegetative patterns,
- trace the patterns of resource exploitation from pre-historic man and early settlers to the present day, and
- explore evolving land use patterns as they are affected by federal and local land management and recovery practices.

The interpretive plan links these three interpretive story sets to identified land management units, specific facility developments and to supporting management practices. For instance, the story of geologic formation can be told by highlighting rock and land form variations and by increasing awareness of vegetation changes that are linked to geologic formations. Settlement sites can be used to reveal the relationships between historic settlement locations, available modes of transportation, and the types and avail-

ability of desirable resources. Early settlers looked for individual farm sites large enough to support their families. Later settlements were constructed to support the wholesale logging off of the region. Once the resource was gone, these settlements and their support services diminished in importance or vanished. Present day uses are less extractive and support recreational uses within the region. Lodging and day-use facilities provide services for visitors and area residents.

To trace the evolution of the corridor, the visual landscape patterns were overlaid with maps of past, present and potential land uses. This overlays were reviewed to reveal possible relationships between potential land uses and interpretive opportunities and to help determine management and facility development prioritization. Analysis also revealed impacts of current management practices and provided a better conception of future directions for USDA Forest Service management of the scenic byway corridor.

LANDSCAPE MANAGEMENT UNITS

The byway corridor has a sequence of natural and cultural landscapes specific to this physiographic and cultural region; each is worthy of interpretation and management. Because landscape patterns are a direct result of land management practices, whether planned or the accumulation of incremental actions, it is vital to the success of any interpretive plan to coordinate land management policies and practices with the interpretive theme and with specific interpretive stories. Analysis of the visual assessment maps and the natural and cultural overlays revealed a sequence of twenty-three (23) landscape units representing seven distinct landscape management units. Each landscape management unit includes areas of similar configuration and actual or projected land uses relating to the byway's interpretive theme. These

management areas include:

- **The Vegetated Tunnel:** Vegetated tunnels are canopied sections of the roadway and afford strong feelings of entry and exit. Sunlight is filtered and variable throughout the day and seasons. Opportunities exist within these management units to interpret regional physiography, particularly in the Whitetop Laurel Gorge area, and vegetation patterns. Because of past timber extractions and subsequent regrowth, today's vegetation stands are a different mix than the older forest. Landscape management policies should encourage effective maintenance of healthy roadway canopy, a "clean" roadside edge, and periodic open and framed views of the creek and geologic formations. There are no "glades" within this landscape management unit.
- **The Vegetative Corridor:** These corridors have discontinuous roadway canopies and are primarily associated with recreational access points. They also have greater potentials for opening or enhancing long distance views. Currently, these narrow background vistas are associated with such recreational uses as fishing, hiking and picnicking. Understory views within this landscape management unit may also open to mid-ground glades. The glades often mark historic fields and other settlement clearings. Management practices should include thinning and pruning to enhance the background vistas and redevelopment of forest glades at historic "cellar hole" locations. (The glades also open up the enclosure of the corridor and provide a more spacious feel to byway travelers.)
- **The Stream Corridor:** The roadbed and stream are adjacent and frequently cross within the stream corridor landscape management unit. Their close relationship reveals the

historic importance of water “gaps” as transportation routes and the stream’s current recreational value for fishing, camping and picnicking. These sections of the corridor require careful management and frequent maintenance because they are visually prominent and subject to over-use and site degradation. Artful efforts are needed to maintain and enhance the health of the streams and to sustain the trout population so that the streams can handle the fishing pressure.

- **The Necklace of Fields:** These sequences of small fields and wooded land forms create a spatial sequence of open and closed spaces. While the fields vary in size and configuration, they frequently contain small residences, farm buildings or abandoned homesteads at one edge. Together they play an important interpretive role in explaining the cumulative effect that seemingly small agricultural practices have on the region’s evolving landscape patterns. Currently, the fields in this unit are in various stages of succession and transition. Land ownership is mixed and effective management will require the development and implementation of numerous private-public partnerships. The fields are often located along streams and next to a transition landscape management unit or are the transition between Forest Service land and privately held settlement areas. Some of the fields are actively used, while others have been left for various lengths of time without care. The goal for these units is to establish a distinct series of open fields, creating an open and close sequence as one passes through the unit. The bands of forest trees or “false” fence rows between the fields should be supplemented to strengthen their presence and a sense of historic property lines.

- **The Large Valley:** In the Large Valley landscape units, a mixed deciduous forest frames and bisects the open fields as they extend down the mountainsides. Cows, rock outcroppings, residential and agricultural buildings of many eras, old apple trees and fields in various stages of succession add interest to this scenic pastoral landscape. Approximately half of the byway is located in the large valley between Mount Rogers and Iron Mountain. In the early 1900s, this valley (known as Fairwood Valley) contained a company lumber town of 3000 residents. Today, a few cellar holes and indicator plantings remain. General landscape management recommendations include: fence clearing and maintenance, roadside ditching to create a stronger edge and to discourage parking along shoulder, limbing trees not immediately adjacent to the roadway to symbolize browse lines, and management of long distance views. Specific facilities are being developed to interpret historic settlements and resource uses within this unit.
- **The Settlements in Transition:** Generally, Settlements in Transition are linear nodes of denser residential and commercial development. Because these areas contain numerous out-parcels, they are the most dynamic management units along the byway. There are continuously changing activities in the residences, agricultural buildings and fields and commercial areas. These units present particularly important land management partnership challenges. Once these partnerships are established management recommendations can be further developed and implemented. Filtered views into the fields should be maintained, the fences repaired and vegetation at the fence rows thinned, or supplemented, and pruned. Succession fields within

these two landscape management units should be left to demonstrate "Landscapes in Transition."

- **Transitional Landscapes:** Transitional Landscape units contain numerous types of land uses and are subject to a variety of land management challenges. Newer residences and commercial structures are being built that could reflect historic patterns. However, they need to meet the service demands of local residents and visitors.

Once the general landscape management units were defined and mapped, specific visitor and area resident needs could be addressed on a site specific basis. Each of these specific uses and facilities could be planned in such a way that each supports the over-all interpretive theme and plays a role in interpreting parts of each interpretive story set.

CONCLUSIONS

The landscape of the Mount Rogers Scenic Byway visual corridor will continue to evolve in response to natural and human actions. Because it is important that people develop an understanding of the magnitude that individual and collective human activities have on a regional landscape, the byway's interpretive program focuses on revealing the collective results of incremental natural occurrences and human activities that comprise the visual character of this corridor. In order to effectively relate these stories, the interpretive plan has to be linked with management policies and practices governing land uses within the visual corridor. By defining a sequence of landscape management units, landscape managers and facility developers can prepare management guidelines that care for the physical health and economic vitality of the land and well as develop specific stories that support the over-all interpretive goals of the managing body.

Note: The Mount Rogers Interpretive Plan and Management Guidelines were prepared by Terry L. Clements and Lynn Crafts. The following students provided research assistance: Chaya Prabhu and Denise Alexander.

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Synecologies, Greenway Planning and the Pursuit of Synergies

by Kenneth R. Tamminga, Penn State University

We will win or lose the biodiversity battle on the landscape between the protected areas.

Gary Merriam, Landscape Ecologist, 1993.

ABSTRACT

Three young sciences – landscape ecology, restoration ecology and conservation biology – could offer invaluable knowledge and insight to greenway and linear parks planners, but presently do so infrequently and with little purposeful focus. Linear parks and greenways invariably traverse damaged anthropogenic landscapes where these synecologies also exert their energies. However, planning is rarely informed by them, and is largely unaware of their philosophical underpinnings and inbuilt biases. Conversely, greenway planning does not effectively appraise the synecologies of either its needs or values. There is a tendency, therefore, to work at cross-purposes.

Synecologies have different efficacies in different regions and scales, depending on the level of landscape degradation and community vision and commitment to pursue a new, sustainable future. Their conceptual bases and array of principles lend themselves to different masters and vested interests and constituents.

A brief case study of an extensive ecosystems planning initiative in the community of Markham, Ontario shows the efficacy of embracing the synecologies. Proposals include preserved and restored ecological nodes, corridors and buffer areas that support and are supported by an *allied* greenway network. The planning team and 'synecologists' worked hand-in-glove from inventories to implementation

strategies. Ecosystems compatibilities and constraints became an integral part of the planning criteria when synecologies informed the planning process.

Every greenway initiative must 'find its own path', based primarily on regional characteristics and socio-political values. But the synecologies should be considered in providing a knowledge base to help guide greenway planning into the twenty-first century.

INTRODUCTION

Partnerships & Sustainability is a timely theme for this year's conference. It merges two of the most promising and energetic solutions to the challenges facing environmental planners in today's complex, contingent world. The former implies changes in the process of acquiring understanding and identifying goals and strategies, while the latter suggests a 'product' - the attainment of the goal of perpetuating a positive environmental, social and economic state through time. This paper will explore one facet of this year's theme: the relationships between greenway planning and the applied ecologies.

'Sustainability' has generated much conceptual debate and semantic rhetoric over the past decade. In so doing, it has acquired a certain dialectic. On one hand, it may have oxymoronic connotations - as in 'sustainable development' suggesting only the inevitability of quantitative growth; on the other it may im-

ply something more ecologically tenable, lasting and non-consumptive.

In confronting Western society's legacy of environmental degradation, Michael Hough (1990, p. 194) suggests that sustainability requires more than just achieving neutrality, and that local action must take place to effect convincing change. Any intervention or modification in the environment should henceforth make a positive contribution to *restoring and enhancing* environmental health and cultural identity. The assertion is that in redressing past abuses, we can proceed in good conscience.

Greenway and linear park proposals invariably confront degraded landscapes. Where many greenway planners see a richly-grained plinth through which to weave a greenway strand, the ecologist tends to see a stress-adapted but crippled landscape, where some lost functions or lifeforms reappear in a different, pathogenic guise (Rapport and Regier 1995).

As socio-cultural artifacts in the human-modified landscape, greenways either contribute to or detract from the sustainability of their region. Like residential sprawl, energy corridors, and traffic thoroughways, they 'consume' land. Lyle (1985), Reese and Ratti (1988) and others have shown that their linear qualities and high edge-to-area ratio can result in significant contact with cultural and natural communities. Planners have a golden opportunity to make meaningful contributions to the search for sustainable, healthy bioregions while meeting related, more focused planning objectives.

A scan of published greenway initiatives across North America suggests that planners have been quite content to cobble together whatever vestiges of natural environment are available in achieving a linear parks system in the cultural landscape.¹ This apparent sta-

tus quo, however, ignores the compensatory obligation of true sustainability in the late modern/post-modern landscape. The process of planning greenways should lead to vital reconstructions of some semblance of ecological health. Greenways by their very nature should serve as vehicles — *frameworks* — for helping restore degraded ecosystems. Frequently, the links made to achieve greenway continuity are too tenuous, and ecological core areas — sensitive habitat, wetlands, interior forest area, etc. — too small. By fragmenting habitats and crenellating vegetative edges, greenway amenities such as trails and planting schemes may, in fact, serve to reduce rather than enhance *regional* biodiversity. By extension, environmental health and integrity are compromised (Noss 1983; Reese and Ratti 1988). This situation may be occurring because a bioregional perspective is not being achieved.² Likely, too, is the common conundrum of having good environmental field data and not knowing how to assess and synthesize it into integrated, ecologically valid solutions. Greenway planners — frequently environmental designers and landscape architects — may still find the integration of intuitive, 'creative' problem-solving with knowledge-based design problematic.

In settled landscapes, the appropriate venue for systematic greenway planning is within the paradigm of ecosystems planning, which "judges proposals not only on economic or social objectives, but also on whether they add to regenerating and improving a region's ecological health" (RCFTW 1992, p. 77). Ecosystems planning as the medium in which greenway planning proceeds allows restoration to consider the entire landscape matrix. With the whole of the settled landscape — the urban bioregion — within the planner's perusal, ecologi-

cal patterns and features past, present and future are within conceptual reach.³

Every landscape system has its own indelible and unique pattern of natural and cultural elements. Just as the notion of landscape as 'palimpsest' has intrigued scholars of cultural landscape history, so may the landscape reveal its layered natural heritage.⁴ If a goal of greenway planning intervention is to make a positive contribution to ecosystems health and integrity⁵ (as it should in most cases), then ecological principles and criteria for preservation, restoration and enhancement must be sought as the primary remedy to the effects of ecological fragmentation.⁶ Greenways and linear parks, as connective, high-contact entities within the landscape, must therefore be considered holistically and contextually.

ECOLOGICAL RESTORATION: THE MISSING INGREDIENT

There appear to be two main reasons why systematic ecological restoration has played such a minor role within existing and proposed greenway networks in the settled landscape. First, land use planning legislation and private property rights have been viewed as major impediments to implementation of the requisite policies and programs needed to embrace a restoration-bolstered greenway system (Steiner 1990; Tamminga 1994). Secondly, knowledge transfer from these sciences through to planning application has been minimal.

Popular greenway planning texts (e.g. Little 1990) are widely accessible to greenway and park planning practitioners. These may commonly be viewed as definitive works on greenway ecology, but may in fact ignore biodiversity issues and the specialized knowledge available in the synecologies. 'Cookbook' publications to date have tended to dwell on

the historical, cultural, or recreational values of greenways and linear parks. As a result, ecological conservation as an aspect of greenway planning has mostly been limited to opportunistic preservation, or at best disjointed, incremental restoration initiatives.

This paper argues that greenway planning must be more inclusive of ecological theory and principles. But it must do so in a manner adapted to regional conditions and opportunities. To discover the ecological palimpsest, to assess its influence within greenway planning process, and to synthesize this knowledge with ecological principles requires the collaborative expertise (*Partnering*) of planner and applied ecologist.

Knowledge and principles gleaned from landscape ecology, conservation biology and restoration ecology ('synecologies', discussed below) can augment and direct the findings of local ecological inventories. Only then will planners, decision-makers and the community embrace visionary greenway networks that build on both 'what's there' and 'what was-and-could-again be there'. However, care must be taken in selectively extracting ecological principles and criteria, since each synecology has built-in philosophical bias and differing foci in terms of landscape scale and venue. An orientation to ecological trends in general and the synecologies especially will better enable the greenway planner to fill current knowledge gaps.

UNDERPINNINGS IN THE SCIENCE OF ECOLOGY⁷

The North American urban realm continues to lose its regionally distinctive biodiversity heritage. In its place is an homogenized array of resilient wild-

life species that flourish in fractured and intensively utilized urban landscapes. Metropolitan and agricultural hinterlands are characterized by processes and conditions of ecological fragmentation, isolated habitats, an over-abundance of opportunistic species, threatened native species gene pools, and even extirpation of indigenous species.

To understand the implications of such conditions, greenway planners must be clearly informed by ecological science. However, if hopes are pinned on ecological *laws*, planners will find them neither broadly confirmed nor in easily digestible form. Ecology is orders of complexity removed from the basic but universal physical laws that have been hard won within the 'purer' sciences (Pomeroy et al 1988; Mann 1988). Furthermore, Lease notes that "the natural sciences are splitting faster than zygotes" (1995, p. 6). Current post-modern trends are influencing the sciences as much as they are the discourse in the arts and humanities (Soulé, 1995). Scientific thought is now largely centrifugal and fragmented rather than convergent and synthetic.

The ecological historian Robert McIntosh has traced the history among ecologists of disagreement over ecological laws. As many as thirty ideas have been represented as solid candidates for ecological law, but have not yet been able to achieve a set of generally accepted constants (regularities or patterns in such things as species and communities), nor have they as yet been able to transform these into quantifiable laws as are found in the physical sciences (cited in List 1994). Even the context within which such laws might be established – ecological theory – has no broadly agreed upon dimensions, making prediction and explanation more difficult (McIntosh 1985).

List provides some relief to the dilemma of the seemingly overly-dynamic condition of past- and present-day ecology: "While any 'normative' appeal to a precise scientific ecology must remain in doubt. . . (ecology) *does* help us understand various lesser regularities and facts about specific ecosystems and non-human communities, and can provide valuable information about human impacts on those natural systems" (1994, p. 196).

Moreover, since McIntosh's inquiry a decade ago, the ecological sciences have made great strides in establishing clearer understanding of natural systems and interrelations at various spatial levels. Discussing the status of large-scale ecosystems design and its application to Biosphere II, Zeigler (1995) notes that systems ecology rises to the status of a mature science when its methods serve as the design bases for a completely artificial, human-engineered ecosystem. The synecologies, by analogy, can be considered nearing maturity, since they have translated principles through to successful application since about the mid-1980s (and much earlier under other titles). And they have done so with open ecosystems far more complex than the closed, artificial precedent cited by Zeigler. Ecosystem studies may never provide universal laws, but they are producing for the pragmatic purposes of greenway planning useful 'normic' or 'probabilistic' statements – descriptive statements of what will normally or probably happen given a set of circumstances (Pomeroy et al. 1988).

When Eugene Odum introduced the third edition of his venerable text *The Fundamentals of Ecology* in the early 1970s, he served as vocal apologist of the Victorian ecological paradigm of stability, equilibrium and order within ecosystems. Other classic ecosystems ecologists reassert and refine Odum's origi-

nal work.⁸ But increasingly, general and questionable pronouncements have given way to more attainable and realistic notions of ecological dynamics.⁹ Revisionist ecologists are challenging ordered models of nature, stressing natural disturbances such as fire, wind, climate, and disease (Worster 1995; Soulé 1995). Even the word 'ecosystem' is losing its luster, having acquired qualifiers such as 'mosaic' and 'patchiness'. No longer are ecosystems seen as tending toward equilibrium or culmination in a perpetual 'climax' state. Neither are biotic 'communities' so cohesive as once believed; instead, ecosystems are considered dynamic and dependent entities, filled with assemblages of mostly competing (Soulé would say 'greedy') species.

Thus, over the past several decades, ecological principles of 'balance' and 'order' have been replaced by the principle of ecological 'gradation' encompassing a continuum of human and natural disturbances, with degrees of stability or diversity depending on spatio-temporal perspectives (van der Valk 1988; Soulé 1995). In everyday life, however, 'ecosystems' and 'communities' continue to be useful terms, minding the provisos stated above. What ecology is telling us is that humans are by far the most important ecological force ('perturbors') today.

The most prominent and resilient of ecological concepts is that of biodiversity.¹⁰ E. O. Wilson (1992) submits that biodiversity is the key to global health world, and that natural disturbance events and ecological succession contribute to "holding the world steady". Biodiversity is now widely held as a key measure of sustainability, from the global to the bioregional and subwatershed scale (Salawasar 1991; UNCED 1992; Riley and Mohr 1994; Soulé 1995). The foundation of biodiversity is genetic variation, permit-

ting species and biological communities to sustain themselves through time.

Primary local and regional threats to biodiversity include habitat fragmentation, simplification of ecosystems and gene pools, the spread of exotic plants and animals, and human intrusion (Salawasar 1991). Each of these threats may be exacerbated or ameliorated through the implementation of greenways and linear parks. Planners must therefore acquire at least a familiarity with the strains of applied ecologies, as well as their scope, their differing paradigms for achieving biodiversity, and their limitations for greenway practice.

TAPPING INTO THE SYNECOLOGIES

If ecology is considered a young science¹¹, its applied offspring can be considered brash neophytes. The synthetic ecologies — or 'synecologies' — of landscape ecology, restoration ecology and conservation biology have existed as distinct fields for no more than two decades.¹²

Odum's (1971) early definition of synecology: "the study of groups of organisms associated as a unit" (1971, p. 6), has been extended to include theory and empirical research of ecosystems and applied problems of human management (Allaby 1992; Clewell 1993). Synecologies, then, are scientific disciplines involved in the bringing together of component parts of an ecosystem (Jordon 1995). These three synecologies, taken collectively, seek to understand ecological fragmentation and related maladies from the site scale to inter-bioregion linkages. They are an essential response to the acknowledged excesses of the consumptive modern era.

Collectively, synecologies offer much useful information to greenway

planning professionals because their foci parallel the scale and venue of much greenway planning. They also are poised to interact creatively within a greenway planning context, not content to be "didactic, trickle-down sciences" (Western 1991, p. 433). Synecologists embrace a prescriptive, mission-oriented view of their work. The restorationist Dennis Martinez (1994) sets an 'eco-inclusive' tone that greenway planners might emulate in calling for "simulated natural systems within which humans are intensively engaged as keystone ecosystem players". Martinez is implicitly acknowledging that ecological restoration is essential in interventions within anthropogenic (human-modified) landscapes.

Any attempt at categorization of evolving disciplines can be risky. For instance, the 'traditional' site-scale foci of restoration ecologists is increasingly challenged within their ranks, both in published works and scholarly symposia.¹³ Nevertheless, a wide and generalized overview of the three flagship journals for each of the synecologies shows

distinct realms of thought and operation. Figure 1 shows five facets — or *modus operandi* — of each. This conceptual framework suggests some in-built strengths and biases in the synecologies, which in turn may help inform the greenway/linear park planner in selecting strategically from each, depending on project context and scale.

As shown, each discipline varies in scale and context, and each proffers a fairly distinctive package of knowledge that discloses their philosophical leanings and environmental foci. The disciplines of landscape ecology and restoration ecology have converged on disturbed ecosystems and fragmented urban and near-urban landscapes. Conservation biology has avoided urbanizing bioregions (see below), but in providing methodological advances and supra-landscape level insights can also be considered a synecology.

Landscape ecology considers the development and dynamics of spatial heterogeneity, spatial and temporal interactions and exchanges across heterogeneous landscapes, influences of spatial heterogeneity on biotic and abiotic processes, and management of spatial heterogeneity (Risser et al., 1984). Forman (1981) more simply explains landscape ecology as the study of the interactions and fluxes of energy, mineral nutrients, and species among clustered stands or ecosystems. Importantly, it defines a landscape paradigm of several working scales of biodiversity within an *ecologically fragmented* region. Typically, scales are discussed as 'alpha' (within habitat or 'ecotope'), 'beta' (between habitat; a local series of habitats), 'gamma' (regional, or watershed) and 'delta' (bioregion or biome) (Noss 1983; Naveh 1994).

There are several divergent currents of investigation in the field of landscape

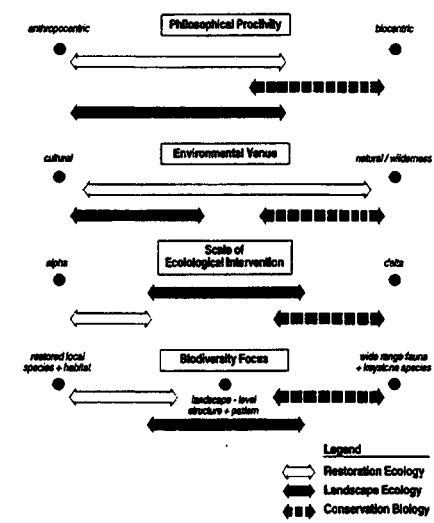


Figure 1. Realms of Synecologies.

ecology which are relevant to planning and design of linear parks and greenways. The most fundamental has to do with the extent to which landscape heterogeneity is embraced at various scales, and how biodiversity is assessed. The noted landscape ecologist Zev Naveh (1994) emphasizes fine-grained beta (landscape matrix) diversity across the whole region. This tends to favor opportunistic, edge-adapted species that prefer fragmented habitat (Noss 1983; Harris and Kangas 1988; Reese and Ratti 1988).

Conversely, Reed Noss (1983, 1986) and many other American landscape ecologists are increasingly coming to support a more comprehensive *gamma* diversity, stressing the role of native vegetation and the conservation of genetic wealth. Here, the approach usually entails a network of ecological reserves and buffers integrated through corridors for species dispersal and colonization (Noss and Harris 1986). This 'multiple-use module' (MUM) model was developed for application to American settled regional landscapes, where vestigial *native* ecosystem components were not so seamlessly integrated with a maturing cultural landscape. The model serves the interests of indigenous ecosystems and genetic materials, and lessens the foothold that generalist species already enjoy in quantity in any urban bioregion.¹⁴ It also discourages the patchy, multi-jurisdictional approach to planning and management clearly evident throughout the

country. Noss and his contemporaries essentially call for a conservation-oriented model that reversed the all-consumptive and outward thrusting tendencies of urban and agro-industrial land uses.

In contrast to the primary MUM objective of indigenous species conservation, Naveh pleads the case of sensitive, native *and* non-native ('naturalized') species, since the landscapes he is considering have been settled and modified for millennia. Naveh's anthropogenic model was developed from investigations of the agro-silvo-pastoral ('perturbation-dependent') landscapes of the Mediterranean chaparral. Where Naveh sees diversity and rich heterogeneity, the more biocentric 'gamma diversity' proponents see a loss of regionally distinctive biodiversity heritage replaced with a homogenized array of species that are able to flourish in fragmented and intensively utilized landscapes. Small, nonviable subpopulations of indigenous plants and animals eventually dwindle away for want of adequate space and genetic inflow (Harris and Kangas 1988).¹⁵

As landscape ecology and conservation biology literature (discussed below) is showing, complex gamma- and delta-scale diversity can suffer when land managers embrace simple beta diversity.

From the perspective of indigenous health and integrity in the path of North American urbanization, the bigger and more well-connected the ecological node/reserve the better.

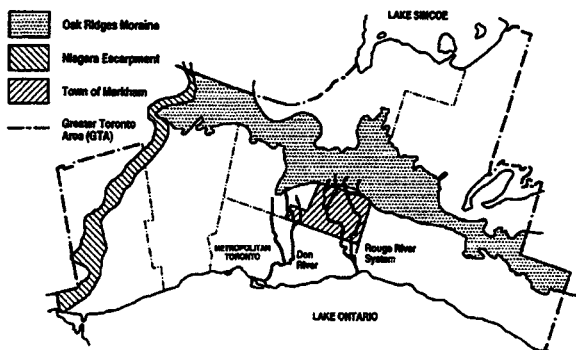


Figure 2. Markham's bioregional context.

However, it is important to perceive the extent to which context and cultural heritage influence ecological modeling. Gamma- and delta-scale diversity become almost irrelevant in long-perturbed areas such as the Mediterranean. Obviously, context and cultural values influence ecological research foci, and hence, the range of principles from which greenway planners may draw.

Restoration ecology is the ensemble of scientific practices that contribute to *ecological restoration* — the total set of ideas and practices (social, scientific, economic, political) involved in the actual restoration of ecosystems. The Society for Ecological Restoration definition states that ecological restoration is “the process of reestablishing to the extent possible the structure, function, and integrity of indigenous ecosystems and the sustaining habitats that they provide” (SER 1994).¹⁶ Restoration ecology offers a wealth of alpha/beta-scale tools to reestablish or enhance urban ecological process and structure. Botany, plant physiology and soil science strongly influences restoration ecology. Issues such as accidental hybridization, propagation of plants of local provenance, and enhancement of soil biotics and structure are well-addressed in scientific literature and field trials.

Conservation biology is a mission-oriented science that justifies the necessity for large areas of interconnected wilderness to ensure species viability over the long term (Grumbine 1992). In his capacity as conservation biologist, Noss (1993) raises a call to action as well as scholarly inquiry: “As vital as high-quality empirical work and hypothesis testing are in conservation biology, we get

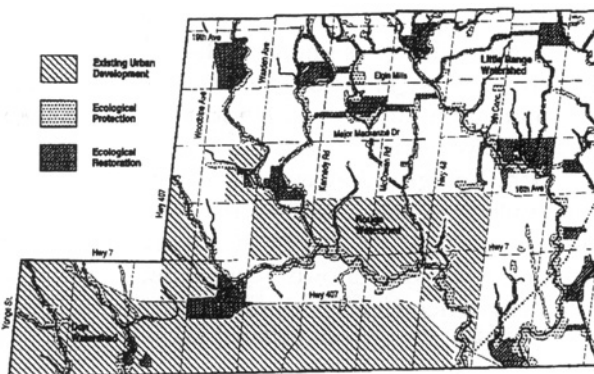


Figure 3. Markham's Plan for the Environment (summary features; greenway trails not shown).

the job done only by translating scientific findings into policy and management prescriptions, and then by getting those prescriptions implemented on the ground” (p. 216).

In contrast to landscape ecology, its biocentric focus on contiguous wildlands (extending at least to the delta/biome scale) as home for wide-range mammals has kept it well away from the urban realm. It traverses similar territory to landscape ecology, however, in its attention to fragmentation in human-modified landscapes (Soulé 1986). The discipline's insights into ecosystems viability analysis, gap analysis and wildlife genetics research, however, could have great potential for urban application (Western 1991).

Other natural sciences have cast their sights on the urbanizing landscape, and are forming alliances with the synecologies. Urban wildlife biology, for instance, focuses on the urban matrix as habitat and niches for individual wildlife populations. While concern may be expressed regarding invasive species such as purple loosestrife, *Phragmites*, the cowbird and zebra mussel, urban wildlife biologists generally see the complex and fine-grained interaction between human and wildlife as a desirable condition (Adams 1994; Dennis 1985). Site-

and species-specific issues tend to be well-addressed, complementing the restoration ecology focus of restored vegetation communities. Gamma-scale diversity, however, is less of an issue.

Ornithologists and avian biologists are similarly collaborators in issues of biodiversity in the urbanizing bioregion. As discussed in the following case study, the plight of neotropical migrants – and synecological prescriptions for their recovery – can play significant form-giving role in the construction of greenway systems.

These illustrations could go on, but the main points have been made. Ecology, its nestlings and its allies are in a state of flux, a normal state for young disciplines raised on a diet of reductionist thinking. A semblance of maturity and scholarly cross-pollination is beginning to build, however. The processes of primarily invalidating earlier theories and ‘laws’ are giving way to substantive observations and even quantitative (and highly complex) field experimentation. The synecologies exhibit, too, an adequate diversity of priorities and opinions, ranging from distinctly anthropocentric to biocentric. Although no universal algorithms for greenway planning and design problems are available, synecological work can provide a strong basis for establishing principles for ecologically-appropriate greenway planning and design decisions.

Following is a case study illustrating how the synecologies informed a major greenway-inclusive ecosystems planning study in a quickly urbanizing Great Lakes bioregion.

CASE STUDY¹⁷

Overview. Markham, Ontario is a large suburban municipality on the north border of Metropolitan Toronto, near the center of the Greater Toronto

Bioregion (see Figure 2). The southerly one-third of its 212 square kilometer landbase is characterized by corporate center nodes and strip commercial development surrounding by low-density residential sprawl (1994 population: 162,000) edging northward into vast tableland cornfields and remnant natural areas. Directly stated, Markham is in dire threat of confirming the assertion of Rapport and Regier that “many locales around the Great Lakes [are] degraded to an abject state of ecological slum” (1995, p. 410).

Bracing for the next large development push and spurred by grassroots activists empowered by a very active “redemocratization” in southern Ontario (Rapport and Regier 1995), municipal council hired a multi-disciplinary consulting team to prepare the *Markham Natural Features Study*, culminating in the comprehensive *Plan for Markham’s Environment*.¹⁸

The two-year study pursued a rigorous ecosystems approach. It was conducted concurrent with an urban growth study and a cultural heritage study. The three parallel planning streams converged at critical points throughout this period to ensure as integrative a process as possible. Specialty disciplines represented on the Natural Features study consultant team included plant ecologists, a forester, wetland and wildlife biologists, a limnologist, fisheries ecologists, a hydrogeologist, and an ornithologist. The synthesis of background information and the preparation of the culminating Plan for Markham’s Environment was a joint effort between the Project Landscape Architect and the Project Ecologist.

The *Markham Natural Features Study* consisted of two phases:

- i) a *Background Report* comprising an eighteen month field study of earth

and life sciences and a literature review of synecological theory and principles, and;

- ii) an *Implementation Plan* for ecological preservation, restoration and greenway trails linked to the surrounding bioregion (see Figure 3).

The *Background Report* reported 2,200 naturally vegetative communities in the field, classified into 18 different types. While this represented 13.6 % of Markham's land area, approximately 8% of this was anthropogenic in nature.¹⁹ Although a few rare birds were noted during the faunal inventory, fauna in Markham was generally found to be indicative of a fragmented and disturbed natural environment. In tandem with the collective synecological knowledge found within the study team, field investigations suggested to the study team that re-creating large contiguous blocks of natural communities should be a priority in the restoration strategy. This would prove to be the primary strategy for accomplishing the biodiversity objective of attaining levels found in other southern Ontario municipalities, including the Greater Toronto Area which is approximately 18% forested (Riley and Mohr 1994).²⁰

The *Implementation Plan* (Phase 2) contained Markham's Plan for the Environment (Figure 3), which expressed "a vision for the community that provides a framework for protecting, restoring and linking up natural features in Markham to achieve a high quality environment, ecological diversity and numerous outdoor recreation opportunities" (GSHWS 1993, p. ES1-ES2). Based on the field studies and review of literature in the synecologies, six objectives were adopted to guide the planning process:

1. To stop further losses of significant natural features and to minimize other losses.

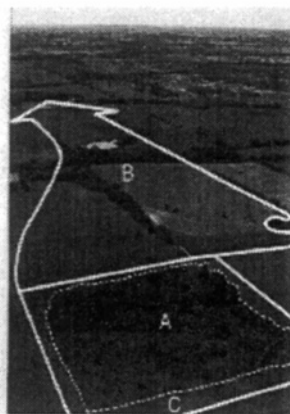


Figure 4. Aerial photograph of natural features in Markham, showing proposed 100m x 100m grid cells (A, B, and C).

2. To improve the remaining ecological resources.
3. To create and improve linkages between natural areas.
4. To create/restore larger contiguous areas of natural communities.
5. To meet the following criteria through implementation of Markham's Plan for the Environment:
 - natural communities - achieve total naturally sustaining vegetative cover of 21% (up from 13.6%).
 - upland woodlots - achieve 11% upland vegetation coverage (up from 3.2%).
 - lowlands - retain and improve lowland communities without losses.
 - aquatic habitat - retain and restore habitat and riparian communities.
 - major nodes - achieve ecological nodes of a minimum of 100 hectares in size, with a spacing of 2.5 kilometers.
 - greenway access - achieve a high level of accessibility to natural communities for residents.
 - fisheries and water - optimize warm and cool/cold water fisheries; achieve maximum temperature of 21°C and minimum dissolved oxygen of 6.0 mg/l for cold water fisheries.

- plants - achieve naturally reproducing vegetation species list of 500 native plant species (up from 1992/93 count of 387 species).
 - birds - achieve a cumulative breeding bird species list of 100 species (up from 1993 level of 77 species), of which a 20% portion will be forest interior species.
6. To monitor these objectives to provide direct measure of the "state of Markham's Environment", as appropriately modified to accommodate changes and new information.

The Plan's vision and objectives denote an ecosystems approach to pursuing biodiversity, and a belief that healthy and accessible environments in turn contribute to community well-being. It nested a greenway strategy within both qualitative and quantitative targets for biophysical health and integrity. Earlier work by various members of the consulting team on both the adjacent Rouge Valley Park and the 'Crombie Commission' had raised awareness of the need for ecological cohesiveness both within and between large scale ecosystems.²¹ Extensive field investigations by life and earth scientists and landscape architects well-versed in synecological principles confirmed earlier recommendations for the Greater Toronto Bioregion (Figure 2). The Plan recognized the need to:

- protect and enhance water recharge areas throughout the Oak Ridges Moraine, and more specifically in the headwaters of the Rouge and Don River watersheds;
- reestablish riparian continuity to link the major ecosystems of Lake Ontario and the Oak Ridges Moraine as a corridor for migratory fish, birds and other wildlife;
- protect existing natural enclaves, such as woodlots and small swamps, from further stress and exploitation;
- link isolated natural features via substantial natural corridors to facilitate native species movement and minimize the effects of predation (Figure 4);
- reestablish tableland linkages between watersheds, for example, between the Rouge, Don and Petticoat/Duffin's Creek watersheds in Markham (Figure 5);
- create a comprehensive greenway network aligned with the ecological network (Figure 3), to be implemented as the restored system matured through time;
- set up land use buffers to preserved, restored and enhanced natural features through the land use planning and development approvals process.

Three overlay schedules detailed the general Markham's Plan for the Environment: 1. Environmental Protection Areas 2. Ecological Restoration Areas 3. Greenway System. The strategies in Schedules 1 and 2 were aggregated with a greenway network plan to produce the overall Greenway System which is at the time of writing proceeding through the formal public review process (Duoba 1995).²²

Ecological Nodes. Ecological nodes (shown as blocks on Figure 3) were comprised of existing significant natural areas to be preserved, as augmented with substantial ecological restoration lands to achieve a block-shaped, cohesive reserve (Figure 5). This major initiative – singular in Canada – would help ensure the objective of 11% upland vegetation cover. It would also help realize a theoretical objective of 10% 'pristine' natural area for each watershed in the Great Lakes called for by Rapport and Regier (1995).

The 100 hectare size of major natural nodes (11 total) was a result of a com-

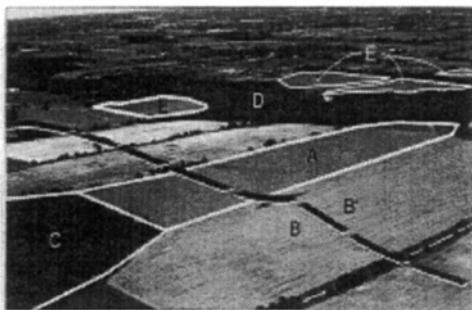


Figure 4. Aerial perspective of the Little River River viewing program. Ecological Corridor (A) leading from node (B) to node (B'). Ecological Node (C). Ecological Preserve (D). Ecological Preserve (E).

bination of inputs, largely from published sources, but also from bioregional observations by members of the study team in the several years preceding the study. Riley and Mohr (1994) cite a number of published articles that suggest a minimum forest interior habitat ('threshold') size in the order of 100 hectares is desirable for many neotropical migrants (e.g. warblers, grosbeaks, thrushes), some neotemperate migrants (e.g. Red-shouldered hawk) and resident species (e.g. Pileated woodpecker). Parasitism from cowbirds is often noted as the major impact on interior breeding neotropical migrants in fragmented landscapes. Wilcove (1987) found that circular woodlots of less than 100 hectares contain no interior secure from significant predation and parasitism.

The shape of the large nodes were as nearly circular as possible to reduce the edge-to-area ratio and related 'edge effects'.²³ It was recognized that woodlands of 100 ha, if not less than 500 m in width in any horizontal dimension, could retain interior habitat (Riley and Mohr 1994). Because of land ownership, agronomic and infrastructural patterns, enlarged and restored nodes tended to be blocky in shape — a reasonable compromise, and a reflection of the joint efforts of planners and ecologists.

A 2.5 kilometer spacing of major natural nodes was cited as being com-

parable to the spacing between nests of interior forest bird species with large home ranges, while allowing each node to function as a discrete ecosystem with minimal territorial disputes.²⁴ The reality of field conditions also played an important role in reserve location. Field inventory revealed that concentrations of regionally rare and significant species tended to congregate near stream confluences, where the dendritic hydrological patterns logically coincided with larger areas of lowland and remnant upland vegetation. Perhaps coincidentally, such major existing nodes were spaced quite consistently near the 2.5 kilometer mark.

Ecological Corridors. The rationale for ecological corridors was based on the landscape ecology principle that species dispersal between patches is crucial to the prevention of genetic stagnation in small breeding populations (Noss 1983), as well as recolonization after periods of environmental stress (Noss 1987). Harris and Gallagher (1989) echo Noss; they found that corridors served to bolster the small natural reserves to which they were attached, effectively enabling populations to occur in urban-agronomic landscapes that might not otherwise support them. If consistent with bioregional conditions and substantial in width, the potential costs of corridors, such as transmission of fire and diseases, could be minimized (Simberloff and Cox 1987). Like ecological nodes, substantial corridors may themselves provide a semblance of interior habitat for habitat specialists such as neotropical migrants, reptiles and amphibians, and some small mammals.

'Strip corridors' wide enough to maintain interior conditions in their centers were preferred exclusively over 'line corridors' (typically hedgerows and utility rights-of-way) that were essentially all

edge habitat. The study team chose a 100 meter corridor width as a compromise between an average maximum of the intrusion of 'edge effects' (e.g. predation and altered microclimate) and a size still able to accommodate some interior habitat. It is also the suggested width required to maintain forest interior tree species such as beech (Ranney et al. 1981). As preliminary GIS-based greenway mapping was field checked and tested in workshop settings, many opportunities arose to establish corridors as wide as several hundred meters, attaining the minimum width criteria for southern Ontario suggested by Riley and Mohr (1994).

Tableland hedgerows and riparian corridors provided the framework for most ecological corridors in rural Markham. Hedgerows that had been haven to predatory generalist species were reconsidered as framing elements for infilled forested corridors (Figures 4 and 5), becoming a primary conduit for ecological restoration and cross-watershed linkages.

Greenway Overlay. The ecological planning process introduced new trail alignment possibilities, sometimes aligned along the field patterns and farmstead lanes established by pioneering Mennonites in the early 1800s, and in other areas delving into preserved natural features. The result was an interesting dialectic: greenway trail alignments along natural patterns of riparian corridors and major nodes, and along cultural patterns in the rural landscape matrix.

Long-term bioregional trail connections were also stressed in the study process. Regional trails plied the more substantial greenways, diverting around sensitive habitats, and connecting the proposed Toronto Waterfront Trail with the Oak Ridges Moraine Trail; trails linking residential and commercial communi-



Figure 6. Aerial photograph of typical Markham development showing isolated opportunity for ecological linkage.

ties with Locally Significant Areas comprised much of the 'secondary' trail system. As the Plan submitted, the "focus is not simply on 'Islands of Green' like typical ESAs (Environmentally Sensitive Areas), but rather on the total greenway system which will become one of Markham's most valued assets" (GSHSW, p. 1-6).

But the greenway system served more than recreational objectives. It was from the beginning conceived as an *ally* in the larger task of ecological renewal. Although the primary purposes of the Plan for Markham's Environment were explicitly ecological, the 'human ecology' aspects of the natural system were as strongly communicated during the planning process. Figure 6, for example, shows a typical lost opportunity for both ecological and recreational linkage between an isolated urban woodlot and more inspirational, ecologically resilient rural features (a mistake municipal planners and developer are not likely to repeat). The concept of day use trail loops in rural areas were quickly grasped by municipal decision-makers; their merit as riparian habitat and new ecological tableland corridors to reestablish links *between* watersheds was not so immediately apparent. Finally, the two regional governments of York and Metro Toronto — as well as the Rouge Valley Park Advisory Committee and the Provincial office of the Greater Toronto Area — seemed as intrigued with the critical regional trail through Markham linking

Lake Ontario with the Oak Ridges Moraine as they were with groundbreaking work in municipal ecosystems restoration.

Clearly, the Markham strategy relied on a close intertwining of both recreational and ecological values. General location and specific alignment of trails was a team effort. For example, planners were made well aware that swaths – even wide paths – cut through forests tracts could not only stress mesic habitat, but could destabilize entire faunal communities (Noss 1983). Plan-making thus became an interactive and iterative, rather than linear, process of concept development and measurement against both ecological and recreational criteria.

Riparian Corridors and Buffers. When Hurricane Hazel struck with immense force over southern Ontario in 1954 it sparked the wide-spread establishment of Conservation Authorities empowered to acquire floodlands and riparian corridors and enact regional flood-protection regulations. The ‘environmental memory’ of this natural disaster is still evident throughout the Greater Toronto Area. Thus equipped with a fairly intact system of stream and river valleys, project hydrologists and biologists were able to establish a comprehensive valleyland classification system. They also noted the capacity of each valley type to accommodate trails.

A review of regulatory precedents and available literature resulted in the following recommended changes to Official (Comprehensive) Plan policy: 10 m setback from the top-of-stable-bank or the drip-line of a Locally Sensitive Area (whichever is greater); 10 m setback from the regulatory floodplain; 10 m setback from warmwater stream; and 20 m setback from coldwater stream, with setbacks vegetated with indigenous plants.

Again, scientists on the study team worked closely with greenway planners not only to chart restrictions for trail locations, but also opportunities through larger valley systems and future development buffers.

On Collaboration. The planner’s experience in pattern recognition, their broad familiarity with ecological principles built up through years of working partnerships with consulting biophysical scientists, and especially their understanding of the cultural landscape and land use policy matrix within/around which the framework existed, provided precisely the ‘kick-start’ that the study team required. The reductionist, analytical strengths of the scientists proved a boon during background study, and a mild encumbrance at the initiation of the plan-making stage. Synthesizing a bioregionally-based ‘pattern language’ of ecosystems restoration as a basis for plan-making proved to be largely the role of the planner generalist, tested against synecological principles during team-wide collaborative workshops.

DISCUSSION

As advocates of green systems and linear parks, greenway planners espouse connectedness of ecological processes and celebrate the interplays of human and non-human forces. But fragmentation still plagues even our lauded examples. Andre Clewell, President of the Society for Ecological Restoration, called for unity between practicing restorationists and restoration ecologists, since they “represent two sides of the same coin – the synergy of theory and praxis” (Clewell 1993, p. 141). A parallel synergy must be attained if the missions of synecologists and environmental/greenway planners are to reinforce each other. The foregoing prece-

dent illustrates one specific approach to achieving the merging of environmental and social objectives. Markham's Plan for the Environment clearly expressed the belief that greenways are at once natural and cultural entities accommodating human aspirations and many life forms and processes.

Seeing What's Not There. Greenway planners miss essential opportunities if they fail to envision the potential for ecological restoration; they often see only 'what's there', not 'what could be there'. The synergies that built the working model in Markham required several paradigm shifts on the part of the planners. This receptivity helped remedy the 'alpha/beta-scale mindset' – common to greenway planners – that result in fragmented solutions to the detriment of regional biodiversity. In acknowledging that natural features (including greenways) in the urbanizing bioregion *are* islands under siege, an urban bioregional awareness was cultured. Different, more visionary solutions were thus achieved.

Conversely, Markham's greenway planners demonstrated to team 'synecologists' the imperative of understanding greenways as cultural constructs melded into the larger cultural/ecological palimpsest. The planners served an important role in synthesizing regional cultural and natural attributes into a cohesive environmental entity. The contrasting pattern of human 'geometric coordinates' (roads, field and hedgerow patterns, other infrastructure, etc.) and the natural (preserved and to-be-restored) achieved a sort of *genius loci*, or sense of place, unique to the Toronto region.

More robust and readily-available criteria for planning and prioritizing greenways as part of a larger mission to enhance ecosystems biodiversity merits

further attention. At the level of both academe and day-to-day practice, the onus is on the greenway planner to set up stronger liaisons with ecologists and scientists in confronting the complex issues along the cultural-natural interface.²⁵ But care must be exercised in bridging the gap; philosophical foci and packages of principles vary widely between and, as noted above, within the synecologies.

Bridging the 'Two Culture' Divide. On a broader level, there is a burden on academe to confirm existing hypotheses and generate new insights. The duality of Western science and the social sciences/humanities has been mostly one of isolation, not dialogue. The natural sciences currently do little to inform the humanities, and vice versa. This false dichotomy presumes that science is not creative and that art (greenway planning?) is immune to scientific reasoning (Higgs, 1993).

In our attempts to make greenway ecology easy, we have often made it trivial.²⁶ Salwasser (1991) suggests that we embrace complexity as an exciting challenge. Perhaps we need to more often consider the contributions our projects make in the fight to slow global biological impoverishment caused by an accelerating downward spiral of biological diversity.²⁷ Surely, the dual-purpose character of most greenway assignments suggests itself as a primary venue to resolve such tension.

Greenways, Place-making and Social Process. Greenway-making at its most profound is part of community-building. Rituals that underpin place-making may help reunite nature and culture. Ecological function and integrity can, through participatory planning, become a shared aesthetic experience, and as such contribute to the *human* quest for

identity and renewal (Norden, 1993).

To adapt an idea from Malcolm Quantrill (1987), greenways must be seen by the people of the community as contributing to its identity, its spirit. The *idea* of the greenway-within-ecosystem must exist in the minds of inhabitants; they "should be conscious of its organizational and formal implications" (p. 33). An essential tenet of placemaking calls for a personal engagement between people and landscape, one that draws from the dynamics of local ecology is a primary ingredient in the potent antidote to the city that Rowe fears is not a *place*, but a "non-stop condition" (p. 59). This newer thinking identifies with the larger bioregion and the informed contributions of scientific and cultural communities; it invites local involvement in ecological place-making through time as a narrative of renewed relationships (people-to-people, people-to-nature). The greenway is an ideal place for this to occur.

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NOTES

¹Many sources detail greenway projects; see, for example Little (1990) and as well as the forthcoming Greenways special issue of *Landscape and Urban Planning*. Vol. 33, October, 1995.

²*Bioregion* (biological region) consists of a geographic area described by its natural characteristics, primarily landforms and watersheds; an area defined by biophysical rather than political boundaries (RCFTW, 1992).

³*Ecosystems planning* is a comprehensive land planning approach that emphasizes the need to balance ecosystem health, quality of life, and economic vitality. Policies and development proposals are not judged solely on their economic merits or other social objectives, but also on whether they add to regenerating and improving a region's ecological health. Ecosystems planning emphasizes the importance of natural and cultural diversity (RCFTW, 1992).

⁴*Palimpsest* is a word of Greek origin used to describe the faintly visible rubbings on an old parchment that has been reused many times.

⁵Norton (in Ramade 1995) describes a general approach to defining *ecosystems health* that involving five axioms: *dynamism, relatedness, hierarchy, creativity, and differential fragility*. These measurable terms of reference have apparently not widely influenced greenway and ecosystems planning practice in urban and near-urban North America.

⁶*Ecological fragmentation* is a characteristic of human-altered landscapes, where natural habitats have been severed, forming a patchy pattern within a disturbed matrix; ecological imbalances are particularly notable at the edge (Riley and Mohr, 1994). Landscapes which are highly fragmented tend to be impoverished ecologically, low in both *health* and *integrity*. *Ecological health* is a capacity of the land (and all its organisms) for self-renewal (Leopold, 1949). *Ecological integrity* is the capability of an ecological area to support and maintain assemblages of organisms that have a composition and functional organization comparable to that of the natural habitat of the region (Riley and Mohr, 1994).

⁷This section was adapted by the author from his contribution to "Beyond the Great Divide: Landscape Architecture, Ecology and the City" by D. Luymes, D. Nadenicek and K. Tamminga (American Society of Landscape Architects Council on Education, Washington, DC, 1995, in press).

⁸Other classic ecosystems ecologists reassert and refine Odum's original work. In fact, a major volume honoring Eugene Odum's retirement reconfirm the ecosystems model (Pomeroy et al. 1988), and argues repeatedly that ecosystems are stable and resilient, albeit characterized by internal interactions between component species and influenced by external material and energy flows.

⁹Lovelock's (1979) Gaia hypothesis is a good case in point. 'Homeostasis' has been shown to have some merit at the global scale in terms of atmospheric self-regulation/feedback. However, at the more relevant spatio-temporal scale of real ecosystems, scientists generally concur it is inapplicable and can lead to a false sense of security (Soulé 1995; Pomeroy et al. 1988).

¹⁰*Biodiversity* (biological diversity) is the variability among organisms from all sources, including terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems (UNCED 1992).

¹¹According to ecological historian Donald Worster (1995) ecology is a post-Darwinian biological science that achieved status as a rudimentary discipline during the 1890s. Founders included Ernest Haeckel, Eugenius Warming, and later Henry Cowles and Frederic Clements.

¹²Flagship journals *Landscape Ecology*, *Conservation Biology* and *Restoration Ecology* were launched in 1987, 1987 and 1993, respectively, but formal organization and scholarly endeavors under these titles occurred earlier. Attempts to restore a collection of ecosystems can be traced at least as far back as work at the University of Wisconsin Arboretum beginning in 1934 (Jordon 1995).

¹³The Society for Ecological Restoration 1995 International Conference "Taking a Broader View", Seattle, Washington strives to expand the horizons of applied ecological restoration. Similarly, Fritts' and Carbyn's (1995) examination of bioreerves for the Gray Wolf indicates a 'cross-pollination' of restoration ecology and conservation biology at the supra-landscape level. Likewise, recognized landscape ecologists such as Naveh (1994) are making inroads into restoration ecology publications in an attempt to broaden the scope and systematic understanding of this field.

¹⁴*Habitat generalist* species utilize many habitat types, while *habitat specialists* are restricted to a specific habitat (Harris and Kangas 1988). Generally in settled, fragmented landscapes, habitat generalists are favored, particularly predatory and invasive species associated with open and edge conditions.

¹⁵Minimum viable population may be defined as the minimum threshold of individuals or some set of other thresholds or limits, that will ensure, at some acceptable level of risk, that a population will persist in a viable state for a given interval of time (Gilpin and Soule 1986).

¹⁶Note that *restoration ecology* and *ecological restoration* have developed different connotations. The Society for Ecological Restoration (SER) continues to struggle with the inherent ambiguities of ecological restoration (refer to SER News, Fall, 1994). Expansion to include international members from Britain, Canada, Australia, Japan and elsewhere has led to debates on a more globalized self-perception, of which discussions on what comprises 'indigenous' nature is the most notable.

¹⁷Unless otherwise noted, information in this section is extracted from *Markham Natural Features Study*, Phases 1 and 2, by GSHSW (1992, 1993). The author contributed on both phases, and was primary author on the *Plan for the Environment* component of Phase 2.

¹⁸Local activists groups included Environment Markham, 10,000 Trees for the Rouge, and Save the Rouge Valley System. The groundbreaking work of David Crombie and the Royal Commission on the Future of the Toronto Waterfront contributed greatly to public and agency awareness of regional environmental degradation and the measures required to preserve, restore and enhance ecological health and integrity in the bioregion.

¹⁹That is, successional vegetation developing on lands disturbed by human activity.

²⁰Riley and Mohr (1994) show that Markham is one of the most denuded municipalities in the province, approaching the 5% forest cover of Kent and Essex County in the grainbelts of the extreme southwest corner of the province.

²¹The Royal Commission on the Future of the Toronto Waterfront became known as the "Crombie Commission" in deference to its Commissioner, David Crombie. Between 1989 and 1993 the author and others on the consulting team contributed to plans to regenerate Toronto's waterfront, restore the lower Don River through the city, and establish the largest urban wilderness park in Canada: the Rouge Valley Park.

²²Land use policy amendments, a redelineation of planning units based on sub-watersheds, environmental guidelines for development, and stewardship and education programs were an integral part of the Phase 2 report.

²³Most criteria for 'edge effect' have been generated by studying avian populations in interior forest settings (see Robbins et al. 1989; Hussell et al. 1992; and Riley and Mohr 1994); however, other effects may include increased insolation, desiccation and sunscald, airborne contaminants and windthrow, increased immigration of insect parasites and weedy species (Riley and Mohr 1994).

²⁴This reserve spacing is also roughly modelled on the natural territorial spacing of Cooper's hawk, Sharp-shinned hawk, Northern goshawk, and Great horned owl (GSHSW 1993).

²⁵Almost 30 years ago Ian McHarg made the request of ecologists to "provide the indispensable information the artificers require" (McHarg 1966).

²⁶A notion borrowed from Leopold's thoughts on land conservation (Leopold, 1949, p. 214).

²⁷This spiral, in turn, is driven by accelerating rates of loss of species and their habitats. Exponential species extinction rates have increased in the last 50,000 years from one extinction per 1000 years to about 1000 extinctions per year; this is projected to reach 40,000 per year by the end of this century - that is, one specie lost every hour (Naveh, 1994).

Land Use Guidance System: A Participatory Method to Achieving Sustainable Growth and Development

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As rural communities continue to grow, leaders are searching for ways to manage their growth responsibly. Rural leaders are looking for alternatives that will fit their communities' needs. In most cases, traditional methods of managing growth in urban areas (such as zoning) will not work. Since many of the methods designed to meet urban needs simply are not suitable for rural communities, alternatives must be explored.

One such alternative is the Land Use Guidance System, which, employed along with the development of a comprehensive land-use plan, provides guidance for rural communities to use in tailoring growth in their county to their own unique needs. It is a practical and cost-effective way of providing services and maintaining the character of a community. Implementing the Land Use Guidance System requires a community or county to first develop a comprehensive plan to serve as a basis for the Land Use Guidance System. Together, the comprehensive plan and the Land Use Guidance System help communities grow and prepare for the future.

Under the Land Use Guidance System, a developer submits his or her development plans to the county. Proposed development projects are then rated for compatibility with the comprehensive plan using a part of the Land Use Guidance System called a Growth Guidance Assessment, which is specifically designed to meet each county's needs. The points in this rating process are assigned according to such factors as the type of

water system needed for the project, type of sewage system needed for the project, distance to a fire station, distance to a rescue squad or ambulance base, compatibility of the project to other businesses and residences in the area, proximity to proposed high density growth areas selected by the community, and impact on the public school system.

The Land Use Guidance System provides a means of rating all projects or changes in use in a consistent manner. The Land Use Guidance System encourages the cost-effective use of local and state tax dollars by promoting development and growth in areas where services and infrastructure can be provided efficiently, and where the developer will have good access to public services. By managing development, communities can most efficiently use and expand public services, such as water, sewer, and emergency response systems. For example, in 1991, four rural communities in Vermont and Virginia were engaged in a study to analyze their revenues and compare the revenues with the cost of their services (Thomas). In each case, services to residential land exceeded the tax revenue that it generated. Not only do the services required by residential land exceed revenues, but these costs also far exceed the service demands of open, industrial, or commercial land. Therefore it is critical for communities to carefully plan how to provide services to residential areas. Even when services are planned for and provided efficiently, they are expensive. When done haphazardly, these costs can create a service

budget deficit for the community. Planning for growth allows communities to avoid the pitfalls of unplanned expansion, which can waste public and private funds by encouraging a shotgun or random approach to providing infrastructure and services.

After a proposed project is evaluated by the planning staff and rated using the Growth Guidance Assessment, the developer describes the plans to adjacent landowners, community members, and planning staff at an open community meeting required by the Land Use Guidance System. The purpose of this meeting is to let residents know about the proposed project, to determine the project's impact on surrounding properties, and to provide a way for the developer to work with community members to achieve the best project possible. The best determination for harmonious growth is considered to be public opinion, particularly that of neighbors and adjacent land owners. With the Land Use Guidance System, the community, therefore, plays an active and vital role in its own growth. The objective of these meetings is not to reject but rather improve development projects. In fact, most projects proposed under the Land Use Guidance System

are approved. In Bedford County, Virginia, the Land Use Guidance System has been in place since 1990. In that time, 148 projects have been processed through the system and 133 of those were approved, which is an 89.8% approval record.

There is a need for increased public awareness, understanding, and involvement in the local planning process, and the Land Use Guidance System provides a new way for citizens to be actively involved in shaping their own communities. To provide a practical guide for rural communities on the Land Use Guidance System, the *Land Use Guidance System Handbook* has been developed. This handbook was created by Western North Carolina Tomorrow, a regional leadership organization made up of volunteer business and community leaders from throughout Western North Carolina. Western North Carolina Tomorrow received funding from the Lyndhurst Foundation for this project. The handbook outlines the Land Use Guidance System, describes the roles of developers, planners and citizens in the process, and includes resource materials such as handouts, reference lists, and overhead transparencies for local groups to use when considering the Land Use

Land Use Guidance System Applications Fiscal Year 1990 to December 1994 Bedford County, Virginia				
Fiscal Year	Received	Withdrawn/ On Hold	Approved	Denied
1990	24	4	17	3
1991	36	6	25	5
1992	34	3	30	1
1993	41	6	31	4
1994	32	2	28	2
1995	10	2	2	0
TOTALS	177	23	133	15
	Percentage approved/denied		89.8%	10.1%

(Note: Six applications still going through process in FY 1995)

Bedford County Planning Department, January 1995.

Guidance System as an alternate growth management method for their county.

The *Land Use Guidance System Handbook* is available to rural communities, county planners and land use planning committees, and others who are interested in land use planning and land policy.

For a copy of the handbook, information about workshops on the Land Use Guidance System, or other related materials, please contact Dr. Susan Smith or Ms. Stefanie Mixon at (704)227-7492 or at WNCT, P.O. Box 222, Cullowhee, NC 28723.

Information on revenue analysis taken from the following:

Thomas, Holly L. "The Economic Benefits of Land Conservation," Technical Memo of the Dutchess County Department of Planning and Development, February, 1991.